DRAFT

Basin Plan Amendment to Revise the Reach Definitions and Chloride Water Quality Objectives for Calleguas Creek

Staff Report: California Regional Water Quality Control Board, Los Angeles Region

December 10, 2001

Executive Summary

This Basin Plan Amendment has been prepared in response to the Regional Board's directive to staff (Resolution 97-02) to assess the chloride concentrations necessary to support agricultural beneficial uses in Calleguas Creek and in support of the draft Calleguas Creek Chloride TMDL. The proposed Basin Plan Amendment would re-define the reaches of the watershed and revise the chloride water quality objective (WQO) in the northeastern tributaries.

The Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, California, 1994 (referred to hereinafter as the "Basin Plan") divides the Calleguas watershed into two reaches, above and below Potrero Road. The WQO for the reaches north of Potrero Road is 150 mg/L. No WQO was set for chloride south of Potrero Road, due to tidal influences.

WQO's are to be set to protect the most sensitive beneficial use or to an even more protective level if natural conditions support it. Agricultral water supply (AGR) has been determined to be the most sensitive beneficial use for chloride; also groundwater recharge (GWR) where groundwater is used to irrigate salt–sensitive crops is also a sensitive beneficial use.

The watershed is marked by variations in topography, soils type, and microclimates, which affect the different agricultural beneficial uses (e.g., types of crops and/or crop yield). However, these differences are not reflected in the current reach definitions. Neither does the two-reach definition reflect other important factors that may influence the assimilative capacity of the water body (e.g., changes in hydrogeology, land use, major discharges, and surface water diversions.) During the early stages of TMDL development, staff recommended re-setting the 150 mg/L chloride objective to 110 mg/L for the entire reach north from Potrero Road. However, local stakeholders asked staff to refine the two-reach designation, and to evaluate the appropriate WQO for each sub-watershed. Staff is proposing herein to re-define the existing two reaches into 14 to better reflect variations in beneficial uses and assimilative capacity. These reach definitions are depicted in Figure ES-1 and Table 1.

Local avocado farmers have testified that continued irrigation with water exceeding 120 mg/L has an adverse impact on avocado production (Regional Board meeting, December 7, 2000, transcript and various correspondences). These findings are consistent with staff's independent literature review. Staff is recommending a lowering of the WQO in the northern tributaries (Reaches 6, 7, and 8 as herein specified) where avocado production is most prevalent from 150 mg/L to 110 mg/L. The new standard would be based on a 12-month rolling average to allow for short-term fluctuations. In addition, a maximum not-to-exceed limit of 180 mg/L would also apply.

The basis for this proposed change is two-fold: 1) the proposed change in the WQO will support the most sensitive agricultural beneficial uses in the northern tributaries and 2) the proposed WQO is consistent with the historical water quality in the northern tributaries. At this time, staff is not recommending any change to the existing WQO in the remaining reaches of Calleguas Creek or in Conejo Creek. Although extensive agriculture is present in these reaches, avocado production is limited and is not dependent on irrigation with surface water or shallow groundwater.

Table ES-1. Proposed Calleguas Creek Watershed Reaches and Water Quality Objectives

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
1	Mugu Lagoon	Lagoon fed by Calleguas Creek	Estuarine; brackish, contiguous with Pacific Ocean.	No Water Body Specific Objective	No Water Body Specific Objective
2	Calleguas Creek South	Downstream (south) of Potrero Rd.	Tidal influence; impermeable layer; tile drains; Oxnard Plain groundwater basin contains both unconfined and perched aquifers.	No Water Body Specific Objective	No Water Body Specific Objective
3	Calleguas Creek North	Potrero Rd. upstream to confluence with Conejo Creek	No tidal influence. Surface water designated beneficial uses include existing AGR and GWR. Agricultural tile drains present. Camrosa WWRF discharges to percolation ponds and to surface water. Pleasant Valley groundwater basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR.	150	150
4	Revolon Slough	From Calleguas Creek Estuary to Central Avenue	Surface water designated beneficial uses include existing AGR and GWR. Agricultural tile drains present. Concrete lined between Central Avenue and Wood Road; from there the slough is soft-bottomed with rip-rapped sides. Pleasant Valley groundwater basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR.	150	150
5	Beardsley Wash	Revolon Slough upstream of Central Ave	Surface water is not designated for AGR or GWR. This rip-rapped channel drains from hills north from the City of Camarillo to Revolon Slough. Agricultural tile drains present.	150	150
6	Arroyo Las Posas	Confluence with Calleguas Creek to Hitch Road	Surface water designated as potential AGR and existing GWR. Normally dry at Calleguas confluence except during storm events. Las Posas groundwater basin designated as AGR. Ventura Co. WWTP discharges to percolation ponds at Moorpark, west from Hitch Road. An important avocado growing region.	150	110 based on a 12- month rolling average and 180 instantaneous maximum.

Table ES-1. Proposed Calleguas Creek Watershed Reaches and Water Quality Objectives

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
7	Arroyo Simi	End of Arroyo Las Posas (Hitch Rd) to headwaters in Simi Valley	Surface water designated intermittent GWR beneficial use; no AGR designation for surface water but flows downstream to Arroyo Las Posas, which has potential AGR and existing GWR. Simi Valley WQCF discharges to surface water. Simi Valley groundwater basin includes both confined and unconfined aquifers. Both are designated as AGR; pumped groundwater and groundwater discharges from shallow aquifers to surface water. Avocado production present in lower segments of this reach; tributary to an important avocado growing region.	150	110 based on a 12- month rolling average and 180 instantaneous maximum.
8	Tapo Canyon (including Gillibrand Canyon)	Confluence w/ Arroyo Simi up Tapo Canyon to headwaters	Origin near gravel mine, used by nursery, ends in residential use area. Surface water designated intermittent GWR beneficial use in Gillibrand Canyon Creek and potential AGR beneficial use in Tapo Canyon Creek. Tributary to Arroyo Simi and Arroyo Las Posas, where AGR and GWR are designated uses. Gillibrand groundwater basin designated as AGR. Tributary to important avocado growing reaches.	150	110 based on a 12- month rolling average and 180 instantaneous maximum.
9A	Conejo Creek	Extends from the confluence with Calleguas Creek to the Camrosa Diversion.	Surface water designated as existing AGR and GWR. Camarillo WWTP discharges to surface water. Pleasant Valley Groundwater Basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150	150
9B	Conejo Creek	Extends from the Camrosa Diversion to the Arroyo Santa Rosa	Surface water designated as existing AGR and GWR. Pleasant Valley Groundwater Basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150	150

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Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
10	Hill Canyon reach of Conejo Creek	Confluence with Arroyo Santa Rosa to confluence with N. Fork; and N. Fork to just upstream of the Hill Canyon WWTF	Surface water designated as intermittent GWR. This reach receives N. Fork surface water that exceeds chloride WQO of 150 mg/L. Hill Canyon WWTF discharges upstream of confluence with N. Fork. Conejo Groundwater Basin designated as existing AGR. Limited cultivation of salt-sensitive crops.	150	150
11	Arroyo Santa Rosa	Confluence with Conejo Creek to headwaters	Surface water designated as intermittent GWR. Olsen Rd WRP to be decommissioned and influent diverted to Hill Canyon WWTF, dry before Conejo Creek confluence except during storm flow. Arroyo Santa Rosa groundwater basin designated as AGR. Limited cultivation of salt-sensitive crops.	150	150
12	North Fork Conejo Creek	Just upstream of the Hill Canyon WWTF to the headwaters	Surface water designated as existing AGR and GWR, but currently exceeds chloride WQO of 150 mg/L. Groundwater designated as AGR but currently exceeds chloride WQO of 150 mg/L. Limited cultivation of salt-sensitive crops.	150	150
13	Arroyo Conejo (South Fork Conejo Creek)	Confluence with N. Fork to headwaters—two channels	Surface water designated as intermittent GWR. Groundwater exceeds the chloride WQO of 150 mg/L. Pumped Groundwater discharges to surface water. Limited cultivation of salt-sensitive crops.	150	150

Figure ES-1. Calleguas Creek Watershed Proposed Reaches (Click on the image to enlarge figure view)

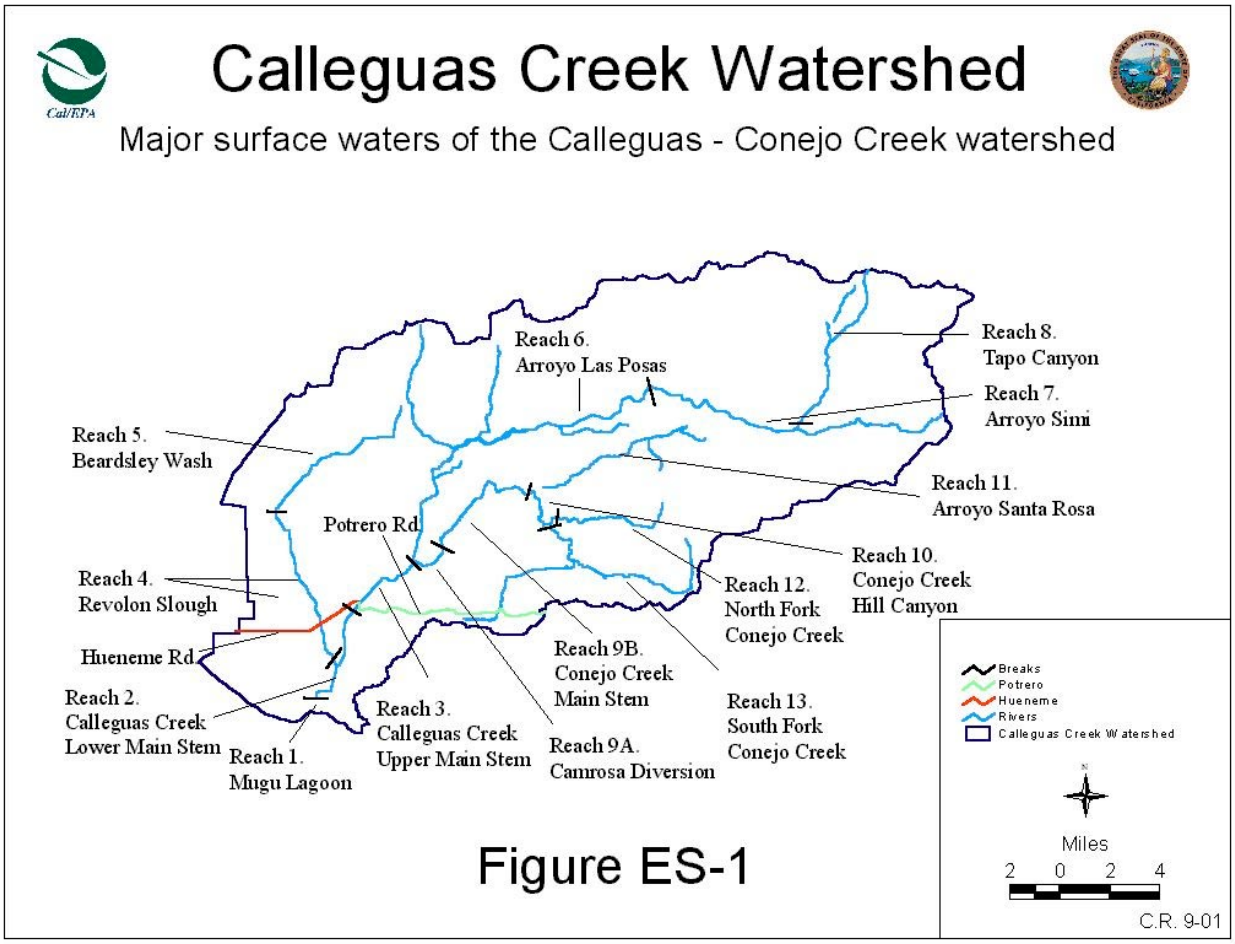

Figure ES- 1

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1.0 Introduction

This Basin Plan Amendment has been prepared in response to the California Regional Water Quality Control Board, Los Angeles Region's (Regional Board) directive to staff (Resolution 97-02) to assess the chloride concentrations necessary to support agricultural beneficial uses in Calleguas Creek and in support of the draft Calleguas Creek Chloride TMDL. The proposed Basin Plan Amendment would redefine the reaches of the watershed and revise the chloride water quality objective (WQO) in the northeastern tributaries.

The Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, California, 1994 (referred to hereinafter as the "Basin Plan") divides the Calleguas watershed into two reaches, above and below Potrero Road. The chloride WQO included in the 1994 Basin Plan for all segments north from Potrero Road (including Conejo Creek and Arroyo Las Posas-Arroyo Simi) is 150 mg/L.

2.0 Historical Background of Chloride WQO in Calleguas Creek

In 1975 the Regional Board established water quality objectives for chloride in most of the region's waterbodies. A chloride objective of 50 mg/L was established for Calleguas Creek at Potrero Road (RWQCB, Los Angeles, Water Quality Control Plan Report, Santa Clara River (4A). March 1975, p. I-4-11).

In 1977, the Regional Board performed a water quality assessment of Calleguas Creek, based upon data collected during 1976 and 1977. The purpose of this assessment was to:

- Determine whether designated beneficial uses of the watershed were correct and appropriate
- Determine whether WQOs were met during 1976
- Determine whether existing water quality objectives are satisfactory or need to be revised.
- Determine whether any other WQO(s) were necessary to fully support beneficial uses.

During 1976, water quality sampling was performed at Calleguas Creek near the former Camarillo Hospital and at Conejo Creek, 2.7 miles upstream from Highway 101. Sampling occurred from April through September 1976. The average chloride value for samples taken near the Camarillo Hospital site was 140 mg/L. A supplemental grab sample was taken on February 2, 1977, at the same site; it had a chloride value of 124 mg/L. The average chloride value of samples taken in Conejo Creek, upstream of Highway 101 was 118 mg/L. This value was compared to 119 mg/L in a supplemental grab sample taken at the same site on February 2, 1977.

Sampling was performed during low flow conditions during "dry weather" years, and samples were expected to contain higher than normal concentrations of mineral constituents. However, the total dissolved solids (TDS) values from these samples were within the range of the WQO (i.e., the average TDS value was 855 mg/L as compared to the WQO of 850 mg/L). It also was noted that the groundwater quality objective for the area was 150 mg/L. Based on this analysis, it was concluded that the chloride surface water quality objective should be raised to 150 mg/L.

In 1978, the Regional Board revised the Basin Plan to change the chloride WQO in Calleguas Creek, north from Potrero Road from 50 mg/L to 150 mg/L (Resolution No. 78-2). The extant WQO for chloride as established in the 1994 Basin Plan is 150 mg/L for Calleguas Creek, north of Potrero Road.

Table 1. Existing Water Quality Objectives

1994 Water Quality Control Plan states Calleguas Creek Watershed has two reaches.	Existing Chloride WQO
Reach one is south of Potrero Road	No objective
Reach two is north of Potrero Road	150 mg/L

During the late 1980s to early 1990s drought, many dischargers had difficulty meeting the chloride discharge limits. In 1990, the Regional Board adopted Resolution No. 90-04 (Drought Policy) which had a term of three years and provided interim relief to dischargers who experienced difficulty meeting chloride objectives because of a California-wide drought. The policy adjusted effluent limits to the lesser of: 1) 250 mg/L or 2) the chloride concentration in the water supply plus 85 mg/L. In 1995, the Regional Board extended the interim limits for three years and directed staff to develop a long-term solution to deal with the impact of changing water supply, especially during droughts.

In 1997, the Regional Board adopted Resolution 97-02 (Chloride Policy) which revised the WQO for chloride to 190 mg/L for specified reaches of the Los Angeles River and 180 mg/L for specified reaches of the San Gabriel River. However, the objective was not revised in the Calleguas Creek and Santa Clara River watersheds, where agricultural beneficial uses were of especial concern. Rather, the Regional Board extended the interim limits in these watersheds and directed staff to carefully determine the chloride concentration that would fully support the agricultural beneficial uses in these watersheds. (See Table 2). These limits are due to expire on March 29, 2002.

Table 2. Interim Chloride Limits for Specified Stream Segments

Calleguas Creek watershed segments for which existing dischargers are subject to Interim Chloride Limits	Interim Chloride Discharge Limit
Arroyo Simi and tributaries-upstream of Madera Road	160 mg/L
Arroyo Simi- downstream of Madera Road, Arroyo Las Posas, and tributaries	190 mg/L
Calleguas Creek and tributaries-between Potrero Road and Arroyo Las Posas (including Conejo Creek, Arroyo Conejo, and Arroyo Santa Rosa)	190 mg/L

In 1996 and 1998, the Regional Board conducted an assessment of the region's water bodies as required pursuant to Section 305(b) of the Clean Water Act (33 U.S.C. § 1251 et seq.) and listed those waterbodies that were impaired because they exceeded applicable water quality standards. The list of impaired waterbodies, known as the 303(d) list, was subsequently reviewed and adopted by the State Water Resources Control Board (SWRCB) and approved by the United States Environmental Protection Agency (USEPA).

Segments of Calleguas Creek were found to not support the AGR beneficial use and were included on USEPA's 1998 303(d) list. At least 25% of the samples within the Calleguas Creek data set had to exceed the WQO in order to be listed. If at least five data points were found in 1995-1998 data set, those data were included in the assessment. The 1998 list also includes listings from 1996, where new data were not assessed during the 1998 assessment. In 1996, waterbody segments were listed if more than 10% of the samples exceeded the WQO.

The Clean Water Act requires states to prepare Total Maximum Daily Loads (TMDLs) for impaired water bodies listed on the 303(d) list. On March 22, 1999, USEPA entered into a consent decree with Heal the Bay, Santa Monica Bay Keeper, et al. The consent decree establishes a schedule for developing TMDLs for impaired waterbodies within the Los Angeles Region. The consent decree scheduled March 22, 2001 as the date for the completion of the Calleguas Creek Chloride TMDL.

Staff began preparing the chloride TMDL for the Santa Clara River in 1998, and for Calleguas Creek in 1999. During this work, it became evident that the existing reach definitions within Calleguas Creek, as defined in the 1994 Basin Plan, were not adequate for assessing the varying assimilative

capacities and loadings, as required in the TMDL. Furthermore, the reach definitions did not reflect differences in beneficial uses.

As part of the completion of a TMDL for chloride, staff analyzed data that were not available when the WQO was revised in 1978. Data gathered during development of the Calleguas Creek TMDL and the Santa Clara River Chloride TMDL, indicated that the chloride objective in Calleguas Creek of 150 mg/L was not fully supportive of the existing agricultural beneficial use within the northern tributaries. This proposed Basin Plan Amendment will facilitate an analysis of differences in beneficial uses, loading and assimilative capacity in various segments of the watershed in support of the TMDL and will ensure that the WQO will fully support the most sensitive beneficial uses throughout the watershed.

3.0 Watershed Description and Background

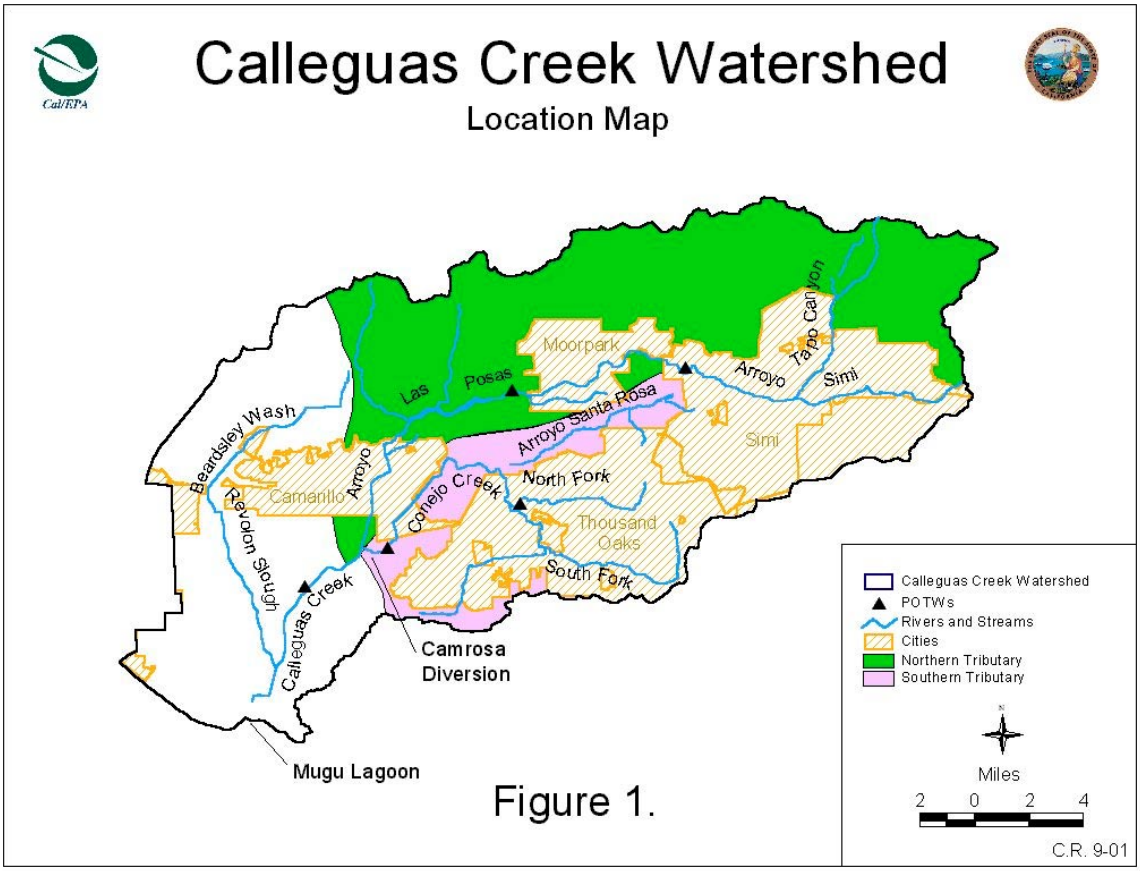
The Calleguas Creek watershed is an elongated basin that drains from the Santa Susana Pass in the east, to Mugu Lagoon to the southwest. The watershed is also divided into creeks that drain the northern section and the southern section (topographic highs separate the north from the south). The watershed encompasses about 343 square miles in Ventura County in an area with a decades-long history of agricultural production and recent trends of rapidly growing residential population. Urban development within the watershed is confined primarily to the Cities of Camarillo, Thousand Oaks, Moorpark, and Simi Valley (See Figure 1).

The watershed has a long history of agricultural use. Beginning from before World War I, the area was used for raising livestock and dry farming. Subsequently, irrigated agricultural became more widespread. Unlike many other agricultural areas within the central and southern part of the State, this area was irrigated almost entirely by local groundwater supplies. Extensive pumping of the deeper aquifers of the Calleguas Creek watershed, including the North Las Posas groundwater basin, resulted in overdraft before the 1960s (USGS, 1980; MWD, 1989.) Shallow wells also were dug or drilled to support agriculture and domestic use. Many of these wells tapped the shallow quaternary aquifers that are located near the creek drainages.

Beginning in the 1970s, the cities of Simi Valley, Moorpark, Thousand Oaks, and Camarillo experienced a rapid increase in residential and commercial development, and increasing amounts of water were imported into the area for domestic, commercial, and industrial use. Surface water flows increased as a result of increased discharges from publicly operated treatment works (POTWs). The increased creek flows served to increase groundwater recharge. Groundwater recharge also increased as some POTWs (i.e., the Ventura County Wastewater Treatment Plant (WWTP) in Moorpark and the Camrosa Wastewater Reclamation Facility (WWRF)) discharged to percolation ponds. As a result of the increased recharge from POTW effluent, the water table in the shallow quaternary aquifers began to rise. However, many of the deep aquifers remain in overdraft due to the extensive pumping for agricultural use. In some instances, the chloride concentration in the POTW discharge is higher than in deep groundwater aquifers and similar to the concentrations seen in the shallow aquifers that are in close communication with the surface water flows. Recharge from imported water and POTW discharges likely has contributed to an increase in chloride concentrations in the shallow quaternary aquifers, and possibly in the deeper aquifers.

In the Arroyo Las Posas area, a decline in quality of agricultural supply water affects a productive agricultural region largely served by the Zone Mutual Water Company. Zone Mutual pumps water from 30-foot deep wells, some within 100 feet of the river. The water is supplied from a shallow quaternary aquifer comprised of highly porous sand and gravels, which is not confined and is assumed to be in direct hydrological connection with the surface water.

Figure 1. Calleguas Creek Watershed Location Map (Click on the image to enlarge figure's view)



4.0 Proposed Changes to Reach Designations

Staff proposes to subdivide the existing two reaches of Calleguas Creek into 14 reaches. The existing reach below Potrero Road would be divided into to reaches that have the same WQOs as the existing reach below Potrero Road, but new reaches would be defined above Potrero Road to provide better correlation between hydrology, dischargers, and beneficial uses. The proposed reaches are depicted in Figure 2. The reach boundaries are described in Table 3, and in the following subsections.

Table 3. Brief Description of Calleguas Creek Watershed Reaches

Existing Reach No.	Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)
1	1	Mugu Lagoon	Lagoon fed by Calleguas Creek	Estuarine; brackish, contiguous with Pacific Ocean.	No Water Body Specific Objective
1	2	Calleguas Creek South	Downstream (south) of Potrero Road	Tidal influence; impermeable layer; tile drains; Oxnard Plain groundwater basin contains both unconfined and perched aquifers.	No Water Body Specific Objective
2	3	Calleguas Creek North	Potrero Road upstream to confluence with Conejo Creek	No tidal influence. Surface water designated beneficial uses include existing AGR and GWR Agricultural tile drains present. Camrosa WWRF discharges to percolation ponds and surface water. Pleasant Valley groundwater basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR .	150
2	4	Revolon Slough	Revolon Slough from Calleguas Creek Estuary to Central Avenue	Surface water designated beneficial uses include existing AGR and GWR. Agricultural tile drains present. Concrete lined between Central Avenue and Wood Road; from there the slough is soft-bottomed with rip-rapped sides. Pleasant Valley groundwater basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR.	150
2	5	Beardsley Wash	Revolon Slough upstream of Central Ave	Surface water is not designated for AGR or GWR. This rip-rapped channel drains from hills north from the City of Camarillo to Revolon Slough. Agricultural tile drains present.	150
2	6	Arroyo Las Posas	Confluence with Calleguas Creek to Hitch Road	Surface water designated as potential AGR and existing GWR for surface water; normally dry at Calleguas confluence except	150

Table 3. Brief Description of Calleguas Creek Watershed Reaches

Existing Reach No.	Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)
				during storm events. Las Posas groundwater basin designated as AGR. Ventura Co. WWTP discharges to percolation ponds at Moorpark; west from Hitch Road. An important avocado growing region.	
2	7	Arroyo Simi	End of Arroyo Las Posas (Hitch Rd) to headwaters in Simi Valley	Surface water designated intermittent GWR. No AGR designation for surface water but flows downstream to Arroyo Las Posas, which has potential AGR and existing GWR. Simi Valley WQCF discharges to surface water. Simi Valley groundwater basin includes both confined and unconfined aquifers. Both are designated as AGR. Pumped groundwater and groundwater from shallow aquifers discharges to surface water. Avocado production present in lower segments of this reach; tributary to an important avocado growing region.	150
2	8	Tapo Canyon (including Gillibrand Canyon)	Confluence with Arroyo Simi up Tapo Canyon to headwaters	Origin near gravel mine, used by nursery, ends in residential use area. Surface water designated intermittent GWR in Gillibrand Canyon Creek and potential AGR in Tapo Canyon Creek. Tributary to Arroyo Simi and Arroyo Las Posas, where AGR and GWR reuses are designated. Gillibrand groundwater basin designated as AGR. Tributary to important avocado growing reaches.	150
2	9A	Conejo Creek	Extends from confluence with Calleguas Creek to the Camrosa Diversion	Surface water designated as existing AGR and GWR. Camarillo WWTP discharges to surface water. Pleasant Valley groundwater basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150

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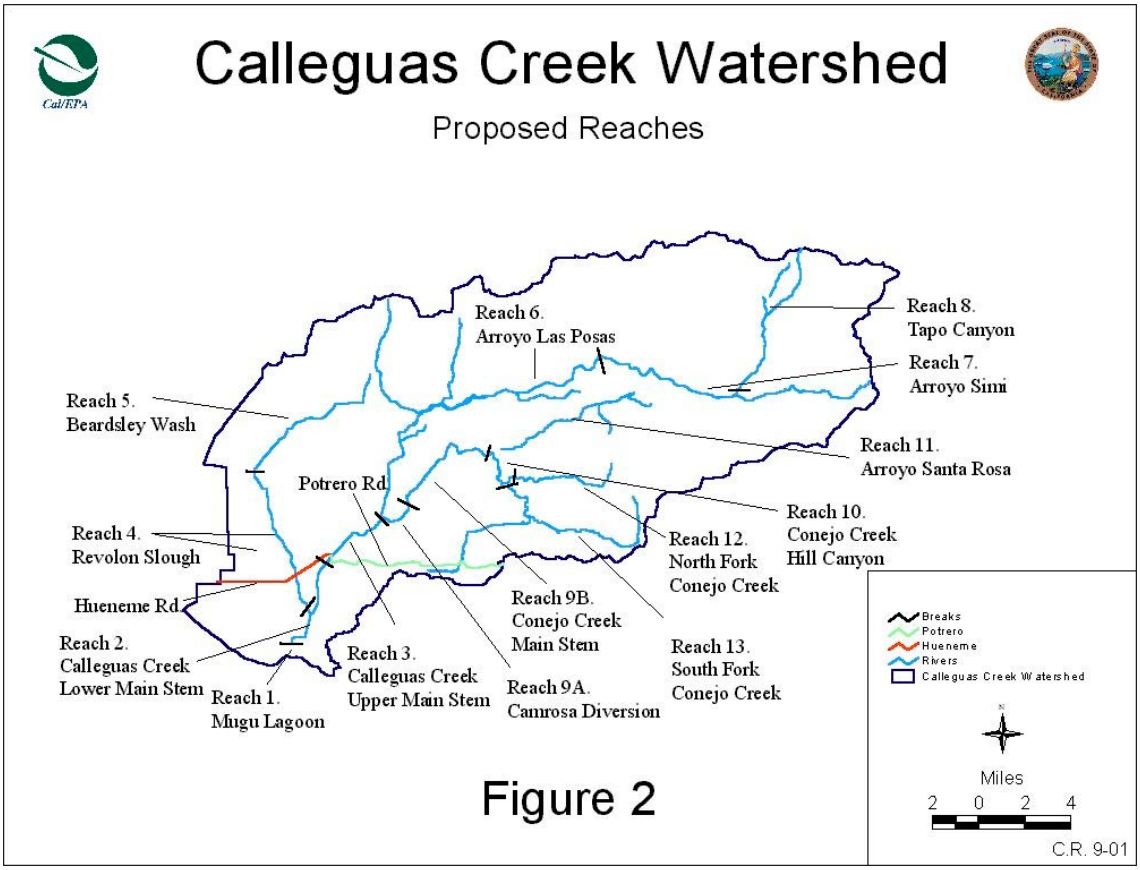
Existing Reach No.	Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)
2	9B	Conejo Creek	Extends from the Camrosa Diversion to the confluence with Arroyo Santa Rosa	Surface water designated as existing AGR and GWR. Pleasant Valley groundwater basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150
2	10	Hill Canyon reach of Conejo Creek	Confluence with Arroyo Santa Rosa to confluence with N. Fork; and N. Fork to just upstream of the Hill Canyon WWTF.	Surface water designated as intermittent GWR. This reach receives N. Fork surface water that exceeds chloride WQO of 50 mg/L. Hill Canyon WWTF discharges upstream of confluence with N. Fork. Conejo groundwater basin designated as existing AGR. Limited cultivation of salt-sensitive crops.	150
2	11	Arroyo Santa Rosa	Confluence with Conejo Creek to headwaters	Surface water designated as intermittent GWR. Olsen Rd. WRP to be decommissioned and influent diverted to Hill Canyon WWTF. Dry before Calleguas Creek confluence except during storm flow. Arroyo Santa Rosa groundwater basin designated as AGR. Limited cultivation of salt-sensitive crops.	150
2	12	North Fork Conejo Creek	Just upstream of the Hill Canyon WWTF to the headwaters	Surface water designated as existing AGR and GWR, but currently exceeds chloride WQO of 150 mg/L. Groundwater designated as AGR; but currently exceeds chloride WQO 150 mg/L. Limited cultivation of salt-sensitive crops.	150
2	13	Arroyo Conejo (South Fork Conejo Creek)	Confluence with N. Fork to headwaters—two channels	Surface water designated as intermittent GWR. Groundwater exceeds WQO (>150 mg/L); City of Thousand Oaks; pumped/treated GW Limited cultivation of salt-sensitive crops.	150

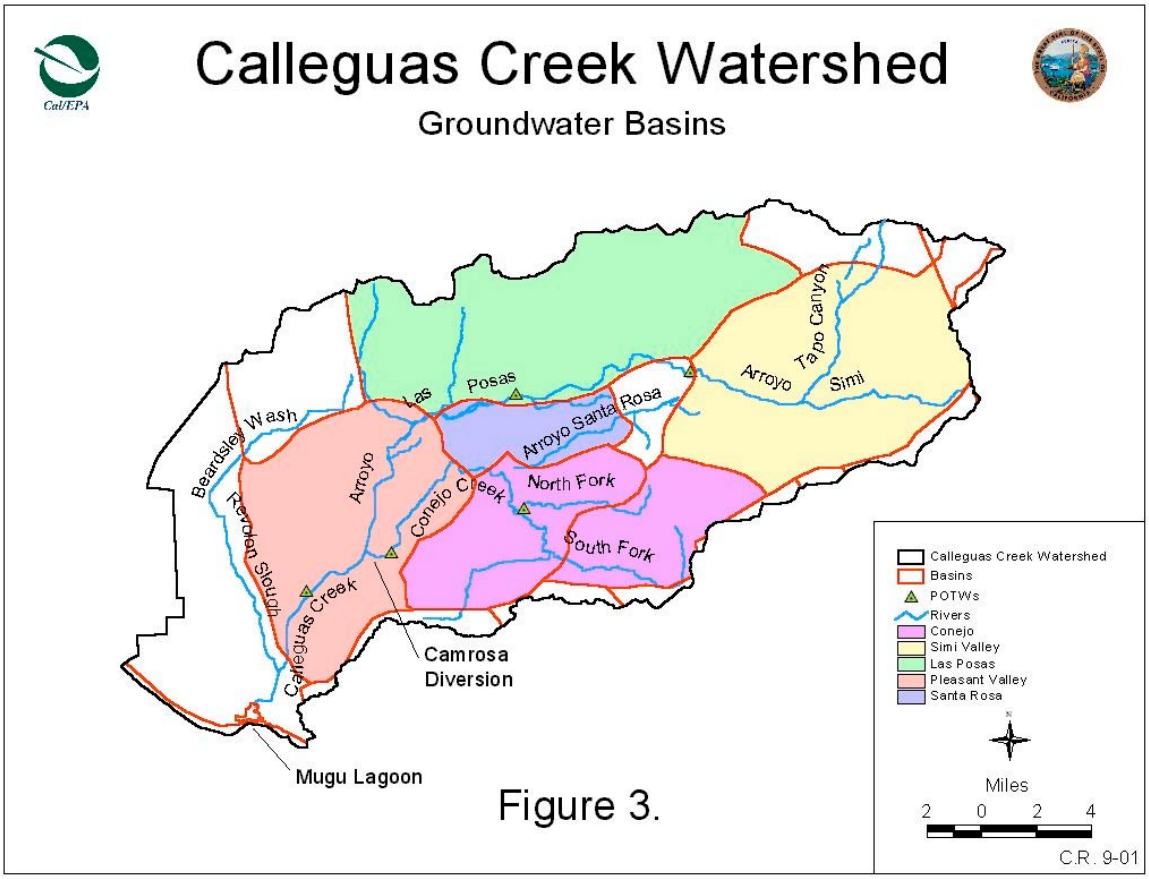
Figure 2 Proposed Reaches (Click on the image to enlarge figure's view)



In order to address water quality issues within the Calleguas Creek watershed, the inter-relationships between surface water and groundwater must be acknowledged. Some reaches of Calleguas Creek support recharge of deep aquifers with large storage capacities. (See Figure 3 for identification of the major groundwater basins within the Calleguas Creek Watershed.) Other reaches are associated with shallow or perched aquifers, separated from deeper soils and aquifers by impermeable clay layers. Waters in those shallow or perched aquifers that are near or underlie the creek bed are believed to be in hydraulic communication with the surface water. In some reaches, groundwater discharges to produce surface flow, then downstream is recharged into the aquifers, and may travel along the stream as subsurface flow from which it may discharge again to appear as surface flow.

Changes in hydrology, locations of major dischargers, and beneficial uses were considered when deciding the proposed reach boundaries. As a starting point, staff divided the watershed into the northern tributaries, the southern tributaries, the western tributaries, the Calleguas Creek main stem and the Mugu Lagoon. References to reach numbers in the following subsections relate to the proposed reaches as described in Table 3.

Figure 3. Identification of the Major Groundwater Basins within the Calleguas Creek Watershed. (Click on the image to enlarge figure's view)



4.A. Northern Tributaries

The northern tributaries of Calleguas Creek originate in the Simi Valley and surrounding foothills, with headwaters at the Santa Susana Pass (Reach 7) and Tapo Canyon (Reach 8). Substantial areas of urban land uses are found in the northern watershed in the City of Simi Valley and the City of Moorpark. In the Simi Groundwater Basin, the groundwater table is high, discharging to the stream under most conditions. Some groundwater is pumped for dewatering, and discharged to the stream. The Simi Valley WQCP discharges treated municipal wastewater to surface water in Reach 7.

Reach 6, receives surface water from Reach 7. In Reach 6, surface flow diminishes under typical non-storm conditions. Much of the water is withdrawn for agricultural irrigation, especially in the up-stream portion of the reach. In the upstream portion of the reach, a system of shallow and perched aquifers above the deeper aquifer is in close communication with the surface water, receiving recharge from the stream channel and discharging in some locations. Water also is withdrawn from these aquifers by pumps and through shallow spring boxes in and near the channel. The Moorpark WWTP discharges to percolation ponds adjacent to the Arroyo Simi and Mejico Creek, a tributary to the Arroyo Simi. During wet weather the plant Moorpark Plant discharges to surface water.

During dry weather, any flow that remains in the lower portion of Reach 6 typically recharges shallow groundwater. The Pleasant Valley Aquifer, underlying the downstream portion of Reach 6 has been in overdraft in recent decades, so recharge capacity is substantial and exceeds the available in-stream flow except during wet season storm discharge. Typically, the Arroyo Las Posas is dry just downstream of the Ventura County WWTP at Moorpark, at a location that varies by season and by year. The stream bed enters the Calleguas Creek main stem (Reach 3), but does not contribute flow or chloride loads except during periods of storm discharge. (Calleguas Municipal Water District and Metropolitan Water District, 1989; Bachman, 1999, Montgomery-Watson, 1995; Larry Walker and Associates, 2000.)

4.B Southern Tributaries

Conejo Creek drains the southeastern portion of the watershed. This area supports significant residential land uses, especially in the Thousand Oaks area, which is drained by the North and South Forks of Conejo Creek. The area also supports significant agricultural land uses, especially in the Santa Rosa Valley area, downstream of the confluence of the North Fork and South Fork and including the area drained by the Arroyo Santa Rosa into Conejo Creek.

The headwaters of the southern tributaries in the North Fork and South Fork of Conejo Creek are proposed as Reaches 12 and 13, respectively. Under non-storm conditions, surface water originates from two processes: discharge of groundwater at springs and overland flow of urban runoff water across portions of the City of Thousand Oaks. Reach 12 begins in the North Fork, just upstream of the Hill Canyon WWTP. It drains the open space of Wildwood Park and the adjacent urban land uses in the City of Thousand Oaks. The channel is concrete lined in the portion that runs through the City of Thousand Oaks, but becomes unlined when it nears the treatment plant. The South Fork drains a larger area primarily consisting of urban and suburban land uses in the southern and western portions of the City of Thousand Oaks. For most of its length, the South Fork flows underground or through concrete lined channels. Under current conditions, typical flow from Reaches 12 and 13 combined is about as great as typical daily discharge from the larger POTWs in the watershed. Water quality of this flow is relatively poor, with chloride levels as high as 165 mg/L. (USGS, 1980; Larry Walker and Associates, 2000.)

The upstream boundaries of Reach 10 are defined as just upstream of the Hill Canyon WWTP in the North Fork and at the confluence with the South Fork. In this reach, the flow is greatly increased by permitted discharges from the Hill Canyon WWTF. In Reach 10, Conejo Creek descends through open space and a relatively shallow groundwater basin. (Staal, Gardner and Dunn, 1991 and 1986.)

At the downstream end of Reach 10, Conejo Creek enters the Santa Rosa Valley. The Arroyo Santa Rosa, Reach 11, is observed to flow at about 1 ft^3/s even during the dry weather season and other non-storm conditions. Sources of this flow are believed to be urban land use runoff in the Santa Rosa Valley, and some groundwater discharge in the upstream portions. The Olsen WRP lies in the Santa Rosa basin and has historically discharged at a rate of about 0.3 MGD. However, this plant is being decommissioned and the influent diverted to the Hill Canyon WWTF. (Boyle Engineering, 1987.)

In the lower Santa Rosa Valley, Reach 9B is proposed where the creek is augmented by rising groundwater from the shallow aquifer system, as well as by urban non-storm runoff and subsurface flows from Reaches 10 and 11. A surface water diversion is being constructed where this reach crosses Highway 101. (Boyle Engineering, 1987.)

The Conejo Creek Diversion project in the Calleguas Creek watershed, when operational, will divert the majority of flow in Conejo Creek to agricultural uses in the Pleasant Valley area. The diversion project is being constructed approximately 7 miles downstream from the Hill Canyon WWTF. The water rights application allows the diversion of an amount equal to Hill Canyon's effluent minus 4 cfs for in-stream uses and channel losses. An additional amount of water equal to the flow contributed by use of imported water in the region (estimated at 4 cfs) may be diverted when at least 6 cfs of water will remain in the stream downstream of the diversion point (SWRCB, 1997). Natural flows due to precipitation will not be diverted. As a result of this project, flows in the lower reach of Conejo Creek could be less than half of the current flows in the creek. Reach 9A extends southwest from the Camrosa Diversion of the confluence with Calleguas Creek. (City of Thousand Oaks, 1995.)

Downstream from the Santa Rosa Valley, in the lower portion of Reach 9A, the surface flow receives treated municipal wastewater discharged by the Camarillo WWTP. Some flow is lost to groundwater recharge in this area. (Larry Walker and Associates, 2000.)

4.C Calleguas Creek Main Stem and the Mugu Lagoon

The Conejo Creek and Arroyo Las Posas-Arroyo Simi drain to the Calleguas Creek main stem in the vicinity of the City of Camarillo. Downstream of the confluence lies the Oxnard Plain, which is drained by Revolon Slough, Beardsley Wash, and the Calleguas Creek main stem.

The majority of flow in Reach 3 is from Conejo Creek and groundwater discharge, as the Arroyo Las Posas is dry, except during storm discharge. In Reach 3, the surface flow is separated from deep underlying aquifers by shallow clay layers, interspersed with perched shallow groundwater aquifers. The local groundwater in this area is high in chloride concentration, with values reaching 200 mg/L and more. The Camrosa WWRF is in this reach and recharges groundwater via percolation ponds. (Staal, Gardner and Dunne, 1991.)

The northern reach of Calleguas Creek extends south to Potrero Road. Calleguas Creek south from Potrero Road (Reach 2) is tidally influenced and therefore a WQO for chloride is not applicable. Reach 1, Mugu Lagoon, at the mouth of the river is also tidally influenced; therefore a WQO for chloride is not applicable to this reach.

4.D Revolon Slough and Beardsley Wash

Revolon Slough and its tributary, Beardsley Wash, drain the Oxnard Plain, in the western portion of the watershed. Revolon Slough extends from the confluence with the Calleguas Creek estuary, upstream to Central Avenue, at the Western edge of the City of Camarillo at the confluence with Beardsley Wash. Revolon Slough is designated for agricultural water supply and groundwater recharge. Beardsley Wash extends from Central Avenue upstream northeast to headwaters located to the north of the City of Camarillo. Beardsley Wash is not designated for agricultural water supply or groundwater recharge. The proposed Basin Plan Amendment will not change the chloride WQO for Beardsley Wash or Revolon Slough.

5.0 Proposed Changes to Water Quality Objectives

The Clean Water Act (Section 303) requires states to develop water quality standards for all waters. Water quality standards consist of a combination of beneficial uses, water quality objectives (WQOs), and anti-degradation policies. Water quality objectives must be sufficiently stringent to fully support the beneficial uses and comply with the applicable anti-degradation policies.

The Clean Water Act section 303 *and* section 13241 of the California Water Code (CWC) direct the Regional Board to establish WQOs for its waterbodies. The CWC stipulates that the Board must establish WQOs that provide reasonable protection of beneficial uses taking into consideration the following factors:

- Past, present, and probable future beneficial uses;
- Environmental characteristics of the hydrographic unit under consideration, including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water.

This proposed revision to the Basin Plan is in response to the Regional Board's directive as provided in the Chloride Policy (97-02) and in support of the Calleguas Creek Chloride TMDL. The proposed Basin Plan Amendment reflects information garnered during the preparation of the proposed Santa Clara River Chloride Basin Plan Amendment, which was presented to the Board in April and December 2000, and the Calleguas Creek Chloride TMDL. On July 12, 2000, staff held a workshop with the Calleguas Creek Watershed Management Plan, Water Resources/Water Quality Subcommittee and proposed changing the WQO from 150 mg/L to 110 mg/L throughout the entire watershed. The stakeholders objected to the "blanket" objective setting and asked staff to refine its analysis and to look more closely at the beneficial uses of the various sub-watersheds.

Staff proposes a revision of the surface WQOs for chloride in the Arroyo Las Posas (Reach 6), Arroyo Simi (Reach 7) and Tapo Canyon (Reach 8), of the Calleguas Creek watershed. The proposed WQO has two elements: 1) a 12-month rolling average concentration of 110 mg/L and 2) an instantaneous maximum concentration of 180 mg/L. Staff believes that the proposed revision will fully protect agricultural beneficial uses of surface water and shallow groundwater, and groundwater recharge beneficial uses within the watershed. It is uncertain as to whether the proposed changes will have any significant impact on the water quality of the deep groundwater basins. These aquifers have been in overdraft since the 1960s. Some have theorized that the rise in chloride in this deep aquifer is the result of the concentrating effect of irrigated agriculture, compounded by the overdraft state of the aquifers.

5.A Beneficial Uses

In order to re-assess the appropriate chloride WQO, a review of the agricultural related beneficial uses as designated in the 1994 Basin Plan was undertaken on a reach-by-reach basis. The Basin Plan designates Agricultural Water Supply (AGR) and Groundwater Recharge (GWR) Beneficial Use as Existing (E), Potential (P), and Intermittent (I), all of which must be fully supported. Tables 2.1 and 2.2 from the 1994 Basin Plan summarize the designated beneficial uses for surface water and groundwater. Excerpts from these tables are reproduced herein as Tables 4 and 5 respectively.

Table 4. Excerpt from Basin Plan Table 2.1: Beneficial Uses of Surface Water for Calleguas Creek Watershed.

Excerpt from 1994 *Basin Plan* Table 2.1: Beneficial Uses for Calleguas Creek Watershed			
Reach	Hydro. Unit No.	AGR	GWR
Calleguas Creek	403.11	E	E
Calleguas Creek	403.12	E	E
Revolon Slough	403.11	E	E
Beardsley Wash	403.61		
Conejo Creek	403.12	E	E
Conejo Creek	403.63		I
Arroyo Conejo	403.64		I
Arroyo Conejo	403.68		I
Arroyo Santa Rosa	403.63		I
Arroyo Santa Rosa	403.65		I
North Fork Arroyo Conejo	403.64	E	E
Arroyo Las Posas	403.12	P	E
Arroyo Las Posas	403.62	P	E
Arroyo Simi	403.62		I
Arroyo Simi	403.67		I
Tapo Canyon Creek	403.66	P	I
Tapo Canyon Creek	403.67	P	I
Gillibrand Canyon Creek	403.66		I
Gillibrand Canyon Creek	403.67		I

E: Existing beneficial use. P: Potential beneficial use. I: Intermittent beneficial use.

Table 5. Excerpt from Basin Plan Table 2.2: Beneficial Uses of Groundwater for Calleguas Creek Watershed.

Excerpt from 1994 *Basin Plan* Table 2.2: Beneficial Uses of Groundwater for Calleguas Creek Watershed		
Basin	DWR Basin No.	AGR
Oxnard Plain	4-4	
Oxnard Forebay		E
Confined Aquifers		E
Unconfined and Perched aquifers		E
VENTURA CENTRAL		
Pleasant Valley	4--6	
Confined aquifers		E
Unconfined and Perched aquifers		E
Arroyo Santa Rosa	4--7	E
Las Posas Valley	4--8	
South Las Posas Area		
NW of Grimes Cyn Rd. and LA Ave. & Somis Rd.		E
E of Grimes Cyn Rd. and Hitch Blvd		E
S of LA Ave between Somis Rd and Hitch Blvd		E
Grimes Canyon Rd. and Broadway area		E
North Las Posas area		E
SIMI VALLEY	4--9	
Simi Valley Basin		
Confined aquifers		E
Unconfined aquifers		E
Gillibrand Basin		E
CONEJO VALLEY	4--10	E

As shown in Tables 4 and 5, existing or potential AGR and GWR beneficial uses are listed for Calleguas Creek, Revolon Slough, southernmost Conejo Creek, the North Fork of the Arroyo Conejo, and Arroyo Las Posas. In addition, GWR is listed an intermittent beneficial use for the northernmost Conejo Creek, the Arroyo Conejo, Arroyo Simi, and Tapo Canyon. All of the major groundwater basins within the watershed are designated as existing AGR. Clearly, AGR is an important beneficial use of the surface water and/or the groundwater in both the northern and southern tributaries and in Calleguas Creek.

5.A.1 Agricultural Water Supply Beneficial Use

The agricultural beneficial use (AGR) is defined by the Basin Plan (CRWQCB, 1994) as "uses of water for farming, horticulture, or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing." The beneficial use guidelines specify that "protection of the most sensitive beneficial use(s) would be the determining criteria for the selection of effluent limits." The beneficial uses most sensitive to chloride in the Calleguas Creek watershed are agriculture and groundwater recharge, where the groundwater is used to irrigate salt-sensitive crops. WQOs are selected based on allowable concentrations that will protect those beneficial uses that existed on or after November 28, 1975, or were potential or intermittent.

The 1994 Basin Plan specifies guidance values for chloride levels necessary to support agricultural beneficial uses as ranging from 100 to 355 mg/L. This guidance also allows considerable leeway in selecting WQOs, and considerable flexibility in selecting the WQO protective of actual uses and observed impacts in each reach of the waterbody.

Local avocado farmers from the Calleguas Creek watershed and the Santa Clara River watershed have testified that continued irrigation with water exceeding 120 mg/L in the Calleguas and Santa Clara River watersheds has an adverse impact on avocado production (Regional Board meeting, December 7, 2000, transcript and various correspondences). These findings are consistent with staff's independent literature review.

The lowest reported observable adverse effect level (first sign of damage) reported in a laboratory study was 70 mg/L, and in a field study, 71mg/L. Other field studies, laboratory studies, expert opinion and farm advisory guidelines describe adverse effects to avocado and strawberry crops beginning with 100-107 mg/L chloride concentration in irrigation water. Bar and others looked at chloride and nitrate effects on avocado and citrus seedlings in a sandy soil. Minor leaf burn was observed on avocado leaves (scale 0-no scorching to 5-severe scorching) at levels of 0.5 and 1 with 2mM (70 ppm) chloride. Branch growth and leaf damage were also reported in citrus plants at higher levels.

Dr. Gary Bender applied reclaimed water to mature avocado trees in Escondido, California. The study showed loss of production where the applied water exceeded 180 mg/L, but did not compare production in waters with less than this concentration. However, the study describes water between 110 and 180 mg/L as potable and those used as the base case in the study ranged from 36 to 196 mg/L with an average of 71 mg/L. According to the author "the literature has reported that the maximum amount of chloride in water tolerated by avocado without development of leaf injury is 107 mg/L (pg. 6-3). Higher levels than the water quality base case averaging 71 mg/L showed increased production in lbs/acre of 29% or greater. The onset of leaf injury found in this study is interpreted to occur between 71 and 180 mg/L. (Bender, 1996)

Ben Faber, UC Cooperative Extension Farm advisor in Ventura and Santa Barbara Counties summarized crop sensitivity to chloride in his 1999 article in California Growers Magazine. "100 ppm of sodium or chloride…can present problems for tree growers. The problems typically show themselves as tip-burn and defoliation….It doesn't mean that the water is impossible to use, only that greater attention needs to be made to ensure that these salts are adequately leached." (Faber, 1998)

Downton and others looked at growth and flowering of avocado trees. Seedlings were grown in loam and watered with concentrated irrigation water. Regular leaching removed salt buildup. No impacts were seen at concentrations of 0 mg/L. With an increase in chloride concentration to 170 mg/L, the researchers documented reduced trunk diameter, reduced dry weight, and increased flowering. (Downton, 1978)

In summary, a review of literature and other expert opinion indicates that optimal conditions for avocado production within Ventura County are created by irrigation with water containing less than 120 mg/L; concentrations exceeding 120 mg/L have resulted in reduced yield. Although crops can tolerate some fluctuation in the chloride concentration, avocado production was not considered viable with irrigation water exceeding 180 mg/L.

The intention of the 1975 Basin Plan to provide this flexibility in the establishment of mineral objectives for agricultural supply is made clear in the reference for the chloride guidance values. The document describes the criteria for agricultural supply water:

> "Absolute limits to the permissible concentrations of salts in irrigation water cannot be fixed, for several reasons: A) It is almost universally true that the soil solution is at least three to eight times as concentrated as the water that replenished it, because

> of evaporation of water from the soil surface, transpiration of plants, and the selective absorption of salts by plants. B) There is apparently no definite relationship between the concentration and composition of the irrigation water and those of the soil solution, which in some cases may be as much as 100 times more concentrated than the water. C) Plants vary widely in their tolerance to salinity, as well as of specific salt constituents. D) Soil types, climatic conditions (such as temperature, rainfall and humidity) and irrigation practices may all influence the reaction of the crop to the salt constituents. E) Interrelationships between and among constituents may be highly significant. (McKee and Wolf, 1963, page 107).

The proposed WQO of 110 mg/L based on a 12-month rolling average, and a maximum not-to-exceed of 180 mg/L is believed to be protective of avocado crops under local growing conditions, while providing flexibility by allowing for fluctuation in short-term chloride concentrations.

5.A.2 Groundwater Recharge Beneficial Use

The groundwater recharge (GWR) beneficial use is defined by the Basin Plan (LARWQCB, 1994) as "uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers." For the Calleguas Creek watershed, an existing, potential, or intermittent groundwater recharge beneficial use is listed for all reaches above Potrero Road, with the exception of Beardsley Wash. In some areas the recharge enters deep aquifers, and in other areas the recharge enters shallow or perched aquifers. Both kinds of aquifers are heavily used in various parts of the watershed for agricultural supply water.

The shallow aquifers are of particular interest where their waters are in close communication with surface waters. Shallow aquifers located upstream of the Simi Valley WQCP, Hill Canyon WWTF, and downstream of Camarillo WWTP discharge groundwater to the surface (without pumping), in varying amounts depending on the depth of the water table. The prominent reaches where shallow groundwater is immediately pumped for agricultural irrigation include the Arroyo Las Posas where Zone Mutual Water Company pumps irrigation water from 30 foot deep wells within 100 feet of the stream, and the Santa Rosa Valley where a local grower, Mr. Howard Jones, pumps irrigation water from a 60 foot deep well within 100 feet of Conejo Creek. (Personal communication.)

5.A.3 Other Beneficial Uses

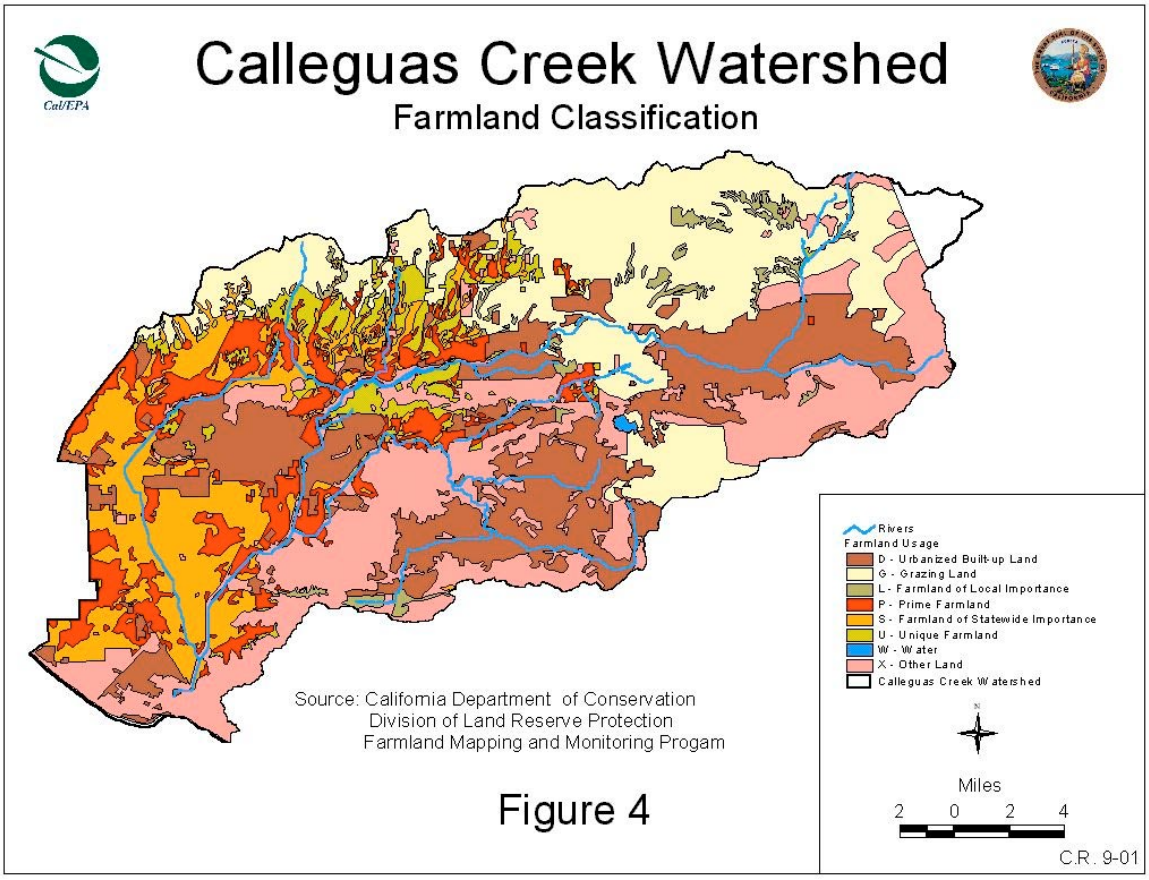
Other beneficial uses are fully supported at WQOs designed to support AGR and GWR where the groundwater is used as an agricultural water supply. The guidance values for protection of freshwater aquatic life is 230 mg/L based on a 4 day average continuous concentration (USEPA, 1988). The guidance value for municipal drinking water supply is 250 mg/L, based on the secondary maximum contaminant level (MCL).

5.B Areas of Sensitive Crops

As described in the previous section, AGR and GWR where the groundwater is used for agricultural water supply, are the most sensitive beneficial uses. Water quality required to support these beneficial uses depend on the crops grown and local growing conditions (e.g., soil characteristics, climate, etc.). Avocados and strawberries are the most chloride-sensitive crops grown historically in the Calleguas Creek watershed. With few exceptions, avocados are grown in all reaches of the Calleguas Creek watershed designated for agriculture except the North Fork of the Arroyo Conejo, but including the undesignated Arroyo Santa Rosa. However, avocado production is most viable in the Arroyo Las Posas/Arroyo Simi subwatershed.

As shown in Figure 4, the California Department of Conservation has mapped the farmland usage within the watershed. This map identifies prime farmland, farmland of statewide importance, and

Figure 4 Farmland Classification (Click on the image to enlarge figure's view)



unique farmland, and farmland of local importance. The farmland classification system takes into account the soils characteristics, climate, and water supply. As shown on this map, the western portion of the Arroyo Simi and the entire Arroyo Las Posas subwatersheds are shown to have significant acreage designated as unique farmland, which may be suitable for special crops including avocados, prime farmland, and farmland of statewide importance. Staff's field visits confirm that avocado crops are grown extensively in the Arroyo Las Posas/Arroyo Simi subwatershed.

A survey conducted of crops grown in the Conejo Creek and Calleguas Creek subwatersheds was prepared by the Camrosa Water District and the Calleguas Municipal Water District (See Appendices B and C, respectively). This information confirms only limited avocado and strawberry production in the Conejo Creek watershed. According to this survey, the most common crops grown in the Conejo Creek and Calleguas Creek watersheds are row crops, citrus, sod, and flowers. Only one grower of avocado in the Conejo Creek watershed was identified in this survey. According to this grower, the hilly terrain of the Conejo Creek watershed results in microclimates that affect avocado production. The viability of avocado production in this area may depend on whether the field is on a south facing or north facing slope. The identified avocado grower does not rely upon surface water or shallow groundwater for the irrigation of these crops, and spoke in support of maintaining the existing water quality objective of 150 mg/L in the Conejo Creek tributaries. With one exception, farmers in the Conejo Creek watershed were in support of maintaining the existing WQO of 150 mg/L in the Conejo Creek and Calleguas Creek Watersheds.

Table 6. California Department of Conservation Farmland Classification

Mapping Categories for the Farmland Mapping and Monitoring Program	
Prime farmland	Land which has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. Water: The soils have a xeric, ustic, or aridic (torric) moisture regimes in which the available water capacity is at least 4 inches per 40 to 60 inches of soil, and a developed irrigation water supply that is dependable and of adequate quality. A dependable water supply is one which is available for the production of commonly grown crops in 8 out of 10 years.
Farmland of State-wide Importance	Land other than Prime Farmland which has a good combination of physical and chemical characteristics for the production of crops. Water: the soils have a xeric, ustic, or aridic (torric) moisture regimes in which the available water capacity is at least 3.5 inches within a depth of 60 inches of soil, or within the root zone if its is less than 60 inches deep. They have a developed irrigation supply that is dependable and of adequate quality. A dependable water supply is one which is available for the production of commonly grown crops in 8 out of 10 years.
Unique Farmland	Land which does not meet the criteria above, that has been used for the production of specific high economic value crops at some time during thee last two update cycles prior to the mapping data. It has the special combination of soil quality, location, growing seasons, and moisture supply needed to product high quality and/or high yields of a specific crop when treated and managed according to current farming methods. Examples of such crops may include oranges, olives, avocados, rice, grapes, and cut flowers. Water: has a moisture supply that is adequate for the specific crop; the supply is from sorted moisture precipitation or a developed irrigation system.
Farmland of Local Importance	Land which is either currently in production crops, has the capability of production, or is used for the production of confined livestock. This land may be important to the local economy due to its productivity or value as designated by the Ventura County Board of Supervisors.

5.C Historical Water Quality and Effects on Agricultural Beneficial Use

Staff reviewed a data set spanning from 1952 to 1997 to evaluate the historical surface water quality in the northern tributaries (Arroyo Las Posas/Arroyo Simi/Tapo Canyon) and the southern tributaries (Conejo Creek). The data sets were divided into three time periods: 1952-1975, 1976-1986, 1987-1997.

5.C.1 Historical Water Quality in Northern Tributaries

The data set for the Arroyo Las Posas, Arroyo Simi, and Tapo Canyon consisted of a total of 91 samples. Most samples contained chloride in concentrations of less than 200 mg/L. However, six samples taken in 1952 exceeded 300 mg/L, with one sample exceeding 800 mg/L. Samples taken in subsequent years were for the most part below 200 mg/L chloride. A single sample taken in the mid 1990s was measured at near 1,200 mg/L. The average chloride concentration was calculated for three time periods: pre-1975, from 1975 through 1986, and from 1987 through 1997. (See Figure 5).

The data set for the period of from 1951 through 1974 consisted of 43 samples. The average chloride concentration was 112 mg/L, with a standard deviation of 179 mg/L. Eight samples, or 19%, exceeded the average. The data set for the period from 1975 through 1986 consisted of 17 samples. The average chloride concentration for this period was 109 mg/L, with a standard deviation of 96 mg/L. In this data set, 53% of the samples exceeded the average. The average concentration during the most recent period, from 1987 through 1997, rose to 194 mg/L, with a standard deviation of 190 mg/L; 13% of the 30 samples exceeded the average.

The entire data set was analyzed to determine whether it was a normal distribution. Using the Anderson-Darling Normality test it was determined that the data set was not normally distributed. However, further, analysis concluded that the values below 100 mg/L and above 100 mg/L are lognormally distributed.[1] In addition, it was noted that the values between 100 mg/L and 190 mg/L show a strong correlation with the chloride concentration in imported water as supplied by the Jenson Treatment Plant for domestic and commercial uses within the Calleguas Creek watershed. The majority of these samples (77%) were taken during the drought, when groundwater discharges to the creek and creek flows were low. This would suggest that discharges from POTWs strongly influence the in-stream concentrations, when the concentrations lie between 100 mg/L and 190 mg/L. Values below 100 most likely result from dilution with storm water flow. Infrequent higher concentrations may result from unidentified sporadic discharge sources.

Staff focused its analysis on the period from 1975 through 1986 as the best indicator of the water quality that existed before the drought. The average concentration in the northern tributaries during this time period was about 110 mg/L. However, the data are highly variable with no discernable spatial or temporal trend. For example the results from the Arroyo Simi at the Madera Road Bridge are recorded as follows: 21 mg/L on August 7, 1977; 205 and 155 mg/L (two samples) on June 2, 1978; 31 mg/L on January 11, 1980; and 30 mg/L on January 29, 1980.

5.C.2 Historical Water Quality in Southern Tributaries

As discussed earlier, the 1978 Water Quality Assessment determined that the average chloride concentration in Conejo Creek was 118 mg/L during 1976. Nonetheless, a single WQO of 150 mg/L was established for all segments of Calleguas Creek north from Potrero Road.

The data set reviewed for this objective setting extends from 1951 through 1997, with approximately 30 samples taken from 1951 through 1974, 56 during the period from 1975 through 1986, and 167 from 1987 through 1997. The data set shows an increasing trend in the chloride concentrations in Conejo Creek beginning with an average chloride concentration of about 80 mg/L for the period prior

[1] Lognormal distributions are characteristic of natural processes with sparse data sets. NPDES Permit Writer's Course. USEPA, 2000).

Figure 5: Calleugas: Surface Water Chloride Concentrations in Simi and Arroyo Las Posas and Tapo Canyon (RWQCB Data Base through 1997)

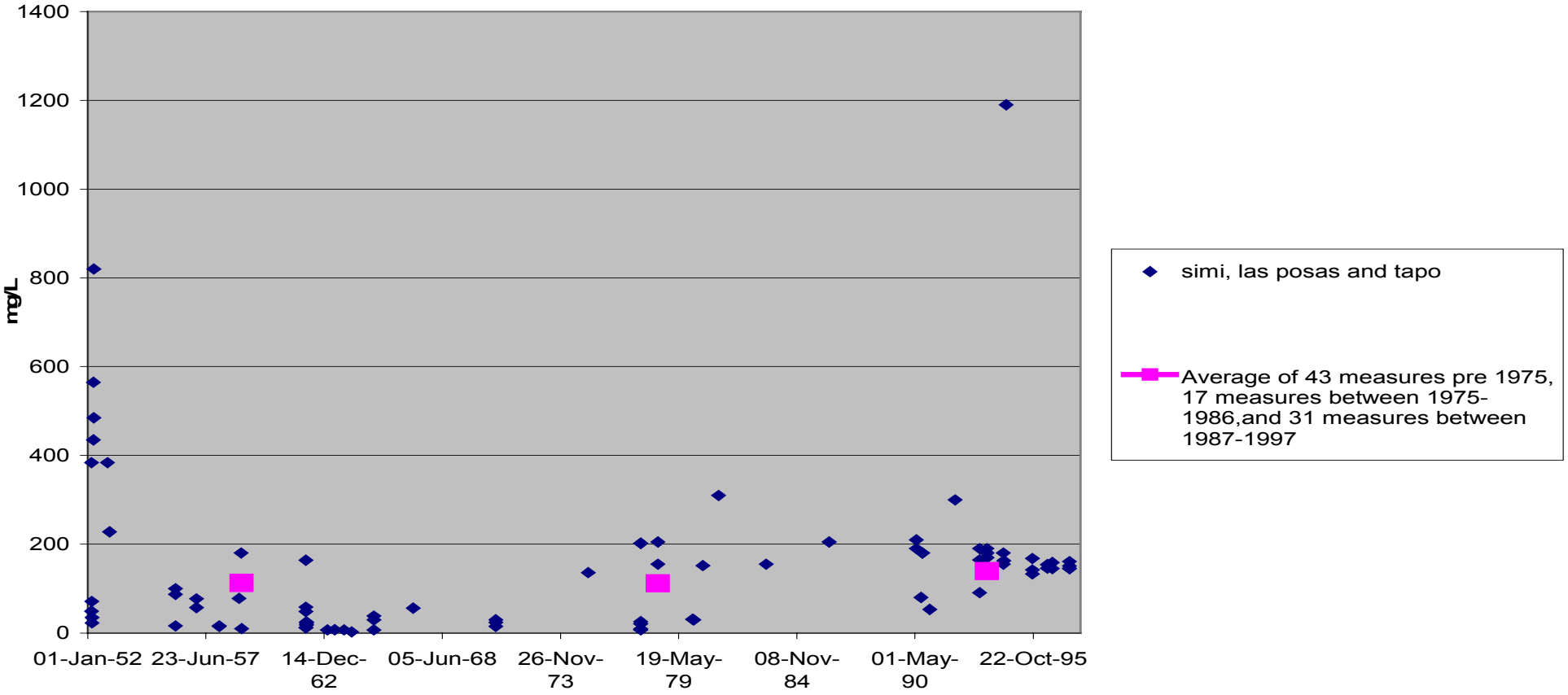
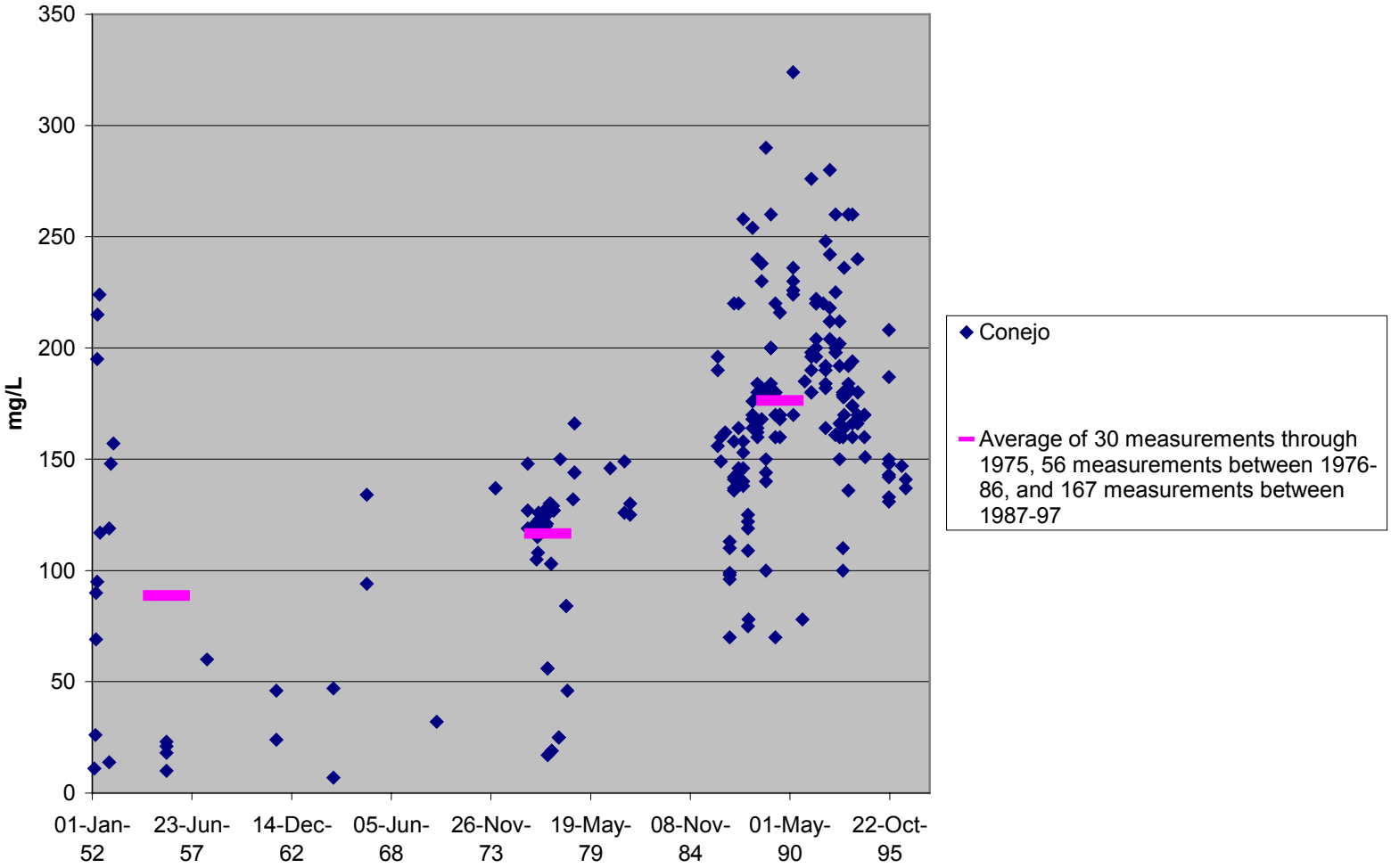


Figure 6: Calleguas: Surface Water Chloride Concentrations in Conejo (RWQCB Data Base through 1997)



to 1975, rising to 116 mg/L for the period from 1975 through 1986, and to 179 mg/L from 1986 through 1997. During the period from 1975 through 1986, only one sample exceeded the WQO of 150 mg/L. In the period from 1987 through 1997, 75% of the samples exceeded the existing WQO of 150 mg/L. (See Figure 6).

5.C.3 Historical Groundwater Conditions

Chloride concentrations in deep groundwater beneath Arroyo Las Posas have averaged about 80 mg/L. The deep Las Posas basin, which underlies Arroyo Las Posas, varied from 57 mg/L to 183 mg/L before 1995 (USGS, 1993, Ventura County Water Resources, 1988). Stratigraphic barriers separate these deep aquifers from overlying shallow quaternary aquifers in Arroyo Las Posas where growers document increasing chloride concentrations. The shallow quaternary aquifer upstream in Arroyo Simi showed a similar wide range of chloride concentrations. Historical values range from 21 to 147 mg/L before 1995 (Simi Valley County Sanitation District, 1995, Ventura County Water Resources, 1998, United Water Conservation District, personal communication, 1999).

5.D Evidence of Impairment

In the Arroyo Las Posas area, a decline in the quality of agricultural supply water affects a productive agricultural region largely served by the Zone Mutual Water Company. Zone Mutual pumps water from 30-foot deep wells, some within 100 feet of the creek. The water is supplied from a shallow quaternary aquifer comprised of highly porous sand and gravels, which is not confined and is assumed to be in direct hydrological connection with the surface water.

The Zone Mutual Water Company provided documentation that nursery customers have stopped purchasing the water due to decreased quality, and that avocado growers who use the water report leaf burn and low crop yield (see Attachment A, Zone Mutual Water District, 1997). Chloride concentrations in wells drilled to these shallow depths ranged from 70-140 mg/L in 1959. The same wells have concentrations ranging from 140-330 mg/L in 1985. The Soil and Plant Laboratory of Orange, California analyzed the water sold by Zone Mutual Water in 1999 and state that their findings "…correlated with comments of a strawberry grower using the water and complaining about the quality." Zone Mutual Water District and local growers attribute the decreasing water quality to increasing discharges from POTWs.

The deeper aquifers underlying the Arroyo Las Posas are also tapped by Zone Mutual and other growers as agricultural supply water. Zone Mutual's documentation shows a smaller increase in the chloride concentration in these deeper aquifer wells. This trend was confirmed and quantified in a 1999 study, "Las Posas Basin Groundwater Elevations and Quality" prepared by Steven Bachman, Ph.D., for the Calleguas Municipal Water District and United Water Conservation District. The author of the report states:

> ". . . the western portion of the East Las Posas basin has seen a deterioration in water quality over the last 15 to 20 years. Diagrams illustrate these changes in both TDS and chlorides. The timing of these water quality changes is directly coincident with the rise in groundwater levels, suggesting that this increased recharge to the basin has been accomplished with water of poorer quality than ambient groundwater in the basin." (Bachman, 1999.)

5.E Proposed Chloride WQO

Staff is recommending a lowering of the chloride WQO in the northern tributaries where avocado production is most prevalent from 150 mg/L to 110 mg/L. The basis for this proposed change is two-fold: 1) the proposed change in the WQO will support the most sensitive agricultural beneficial uses in

the northern tributaries, and 2) the proposed WQO is consistent with the historical water quality data, which averaged about 110 mg/L, but exhibited a high degree of variability with no apparent spatial or temporal trend.

At this time, staff is recommending no change to the existing WQO in Calleguas Creek or in Conejo Creek. Although extensive agriculture is present in these reaches, avocado production is limited and is not dependent on surface water or shallow groundwater. The proposed WQOs for the Arroyo Las Posas, Arroyo Simi, and Tapo Canyon reaches, and the existing WQOs for the other reaches in the watershed are listed in Table 7.

The new objective would be based on a 12-month rolling average to allow for short-term fluctuations. Significant fluctuations were noted in the historical record and guidance on the setting of WQOs for agricultural beneficial uses allow for fluctuations. As stated by McGee and Wolf (1963), many factors other than irrigation water impact the salt concentration within the root zone of the tree and WQOs for agriculture should not be too rigid. Thus, establishing the WQO based on a 12-month rolling average appears to be protective of the agricultural beneficial use and justified based on the variation in chloride concentrations seen in the historical data set. A maximum not-to-exceed limit of 180 mg/L would also apply. It is necessary to establish an upper bound on the allowable values, as the average value alone does not provide a complete indicator of water quality. The upper bound objective is set at values that have been reported to seriously impair avocado production.

The allowable concentration of chloride to support agricultural beneficial uses depends on the chloride tolerance of a specific crop, which varies greatly among crop types. For most crops, no firm consensus exists about the chloride tolerance. Tolerance may depend on local conditions such as soil and climate, and varies depending on availability of alternate sources for leaching (such as ample precipitation). Further, crop degradation is not immediate or sharply defined; some degradation may reduce economic returns of the crop but not preclude the beneficial use. Selecting a WQO to support the beneficial must consider these imprecisions and uncertainties.

Table 7. Proposed Chloride WQOs for Calleguas Creek Reaches

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
1	Mugu Lagoon	Lagoon fed by Calleguas Creek	Estuarine; brackish, contiguous with Pacific Ocean	No Water Body Specific Objective	No Water Body Specific Objective
2	Calleguas Creek South	Downstream (south) of Potrero Road	Tidal influence; impermeable layer; tile drains; Oxnard Plain groundwater basin contains both unconfined and perched aquifers.	No Water Body Specific Objective	No Water Body Specific Objective
3	Calleguas Creek North	Potrero Road upstream to confluence with Conejo Creek	No tidal influence. Surface water designated beneficial uses include existing AGR and GWR. Agricultural tile drains present. Camrosa WWRF discharges to percolation ponds and surface water. Pleasant Valley groundwater basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR.	150	150

Table 7. Proposed Chloride WQOs for Calleguas Creek Reaches

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
4	Revolon Slough	Revolon Slough from Calleguas Creek Estuary to Central Ave	Surface water designated beneficial uses include existing AGR and GWR. Agricultural tile drains present. Concrete lined between Central Ave. and Wood Rd; from there the slough is soft-bottomed with rip-rapped sides. The lower mile and a half of the slough appear to be tidally influence. Pleasant Valley Groundwater Basin includes confined (impermeable layer) and unconfined perched aquifers. Both are designated as existing AGR beneficial	150	150
5	Beardsley Wash	Revolon Slough upstream of Central Avenue	Surface water is not designated for AGR or GWR beneficial uses. This rip-rapped channel drains from hills north from the City of Camarillo to Revolon Slough. Agricultural tile drains present.	150	150
6	Arroyo Las Posas	Confluence with Calleguas Creek to Hitch Road	Surface water designated as potential AGR and existing GWR. Normally dry at Calleguas confluence except during storm events. Las Posas Groundwater Basin designated as AGR. Ventura Co. WWTP discharges to percolation ponds at Moorpark, west from Hitch Road. An important avocado growing region.	150	110 based on a 12- month rolling average and 180 instantaneous maximum.
7	Arroyo Simi	End of Arroyo Las Posas (Hitch Rd) to headwaters in Simi Valley	Surface water designated intermittent GWR. No AGR designation for surface but flows downstream to Arroyo Las Posas, which has potential AGR and existing GWR. Simi Valley WQCF discharges to surface water. Simi Valley groundwater basin includes both confined and unconfined aquifers. Both are designated as AGR. Pumped groundwater and groundwater discharges from shallow aquifers to surface water. Avocado production present on lower segments of this reach; tributary to an important avocado growing region.	150	110 based on a 12- month rolling average and 180 instantaneous maximum.
8	Tapo Canyon (including Gillibrand	Confluence with Arroyo Simi to Tapo Canyon to headwaters	Origin near gravel mine, used by nursery, ends in residential use area. Surface water designated intermittent GWR	150	110 based on a 12- month rolling average and 180

Table 7. Proposed Chloride WQOs for Calleguas Creek Reaches

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
	Canyon)		in Gillibrand Canyon Creek and potential AGR in Tapo Canyon Creek. Tributary to Arroyo Simi and Arroyo Las Posas, where AGR and GWR reuses are designated. Gillibrand groundwater basin designated as AGR. Tributary to important avocado growing reaches.		instantaneous maximum.
9A	Conejo Creek	Extends from the confluence with Calleguas Creek to the Camrosa Diversion	Surface water designated as existing AGR and GWR. Camarillo WWTP discharges to surface water. Pleasant Valley groundwater basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150	150
9B	Conejo Creek	Extends from the Camrosa Diversion to the Arroyo Santa Rosa	Surface water designated as existing AGR and GWR. Pleasant Valley groundwater basin contains both confined and unconfined perched aquifers. Both are designated as AGR. Limited cultivation of salt-sensitive crops.	150	150
10	Hill Canyon reach of Conejo Creek	Confluence w/ Arroyo Santa Rosa to confluence with N. Fork; and N. Fork to just upstream of Hill Canyon WWTF	Surface water designated as intermittent GWR. This reach receives N. Fork surface water that exceeds chloride WQO of 150 mg/L. Hill Canyon WWTF discharges upstream of confluence with N. Fork. Conejo groundwater basin designated as existing AGR. Limited cultivation of salt-sensitive crops.	150	150
11	Arroyo Santa Rosa	Confluence with Conejo Creek to headwaters	Surface water designated as intermittent GWR. Olsen Rd WRP to be decommissioned and influent diverted to Hill Canyon WWTF. Dry before Calleguas Creek confluence except during storm flow. Arroyo Santa Rosa groundwater basin designated as AGR. Limited cultivation of salt-sensitive crops.	150	150
12	North Fork	Just upstream of the Hill Canyon WWTF to the	Surface water designated as existing AGR and GWR, but currently exceeds chloride	150	150

Table 7. Proposed Chloride WQOs for Calleguas Creek Reaches

Proposed Reach No.	Reach Name	Geographic Description	Notes: Hydrology, Beneficial Uses, etc.	1994 *Basin Plan* Chloride WQO (mg/L)	Proposed Chloride WQO (mg/L)
	Conejo Creek	headwaters.	WQO of 150 mg/L. Groundwater designated as AGR; but currently exceeds chloride WQO of 150 mg/L. Limited cultivation of salt-sensitive crops.		
13	Arroyo Conejo (South Fork Conejo Creek)	Confluence with N. Fork to headwaters—two channels	Surface water designated as intermittent GWR. GW exceeds chloride WQO of 150 mg/L. Pumped groundwater discharged to surface water. Limited cultivation of salt-sensitive crops.	150	150

6.0 Local Government Water Quality Management Efforts

In support of the watershed management approach, staff has consulted with the Calleguas Creek Watershed Management Plan, Water Resources/Water Quality Subcommittee (Water Quality Subcommittee) throughout the development of the proposed Basin Plan amendment. Staff made four presentations to the Water Quality Subcommittee in 1999, on April 4, June 4, July 21, and August 6. Staff made three presentations to the Subcommittee in 2000, on March 3, June 4, and on October 10. In addition, staff met with representatives of the POTWs on December 19, 2000, and with representatives of the Camrosa Water District and the Calleguas Municipal Water District on March 2, 2001.

The Calleguas Municipal Water District has proposed a plan to control salt levels in surface water and groundwater in the Calleguas Creek watershed. The plan would require reverse osmosis (RO) or de-salting technology to reduce the salt content of POTW effluent discharges, and pumping and treating of groundwater. A brine line and ocean discharge would be constructed to remove the resulting treatment concentrates. As proposed, the project would include treatment of the Simi Valley WQCF and the Camrosa WWRF effluent, but not the Hill Canyon WWTF in Thousand Oaks. Project proponents have estimated that the additional cost of constructing the brine line to the Hill Canyon plant to be $4.5 million. The total brine line project cost has been estimated at $50 million. In addition, it has been suggested that the construction of a brine line in the rugged terrain and in the riparian corridor between the Camarillo plant and the Hill Canyon plant would result in significant adverse environmental impacts. A draft Environmental Impact Report (EIR) for the proposed brine line is expected to be released in December 2001. (See Appendix E hereto).

Staff believes that proposed change in WQO in the northern tributaries and the existing WQO can be achieved with the implementation of the proposed brine line and associated treatment facilities. However, a reduction in the existing WQO in Conejo Creek likely would require RO treatment at the Hill Canyon WWTP and either extension of the brine line or trucking of the brine to the brine line or another appropriate disposal point. During drought conditions, the Hill Canyon WWTF may need to

treat at least a small portion of its flow even to meet the existing WQO of 150 mg/L. However, it is anticipated that the brine resulting from this treatment could be trucked to the Camarillo WWTP.

Representatives from the City of Thousand Oaks, the Camrosa Water District, and the Calleguas Municipal Water District have opposed the lowering of the WQO in the Conejo Reach and the extension of the brine line to the Hill Canyon WWTP. They argue that the cost of treatment and extension of the brine line are not warranted to protect agricultural beneficial uses downstream from Hill Canyon. In 1997, the City of Thousand Oaks was awarded the water rights to the surface water downstream from the Hill Canyon Plant (SWRCB Decision No. 1638). Together, with the Camrosa Water District and the Calleguas Municipal Water District, the City is constructing a diversion near the Camrosa Wastewater Reclamation Facility. To date, approximately $15 million has been invested in the construction of the Camrosa Diversion. (See Appendix D, hereto.) Under the SWRCB decision, the City may divert all but 6 cubic feet per second, which is to be reserved to support downstream aquatic habitat. The diverted water will be treated as needed using de-salting technology and sold to farmers, injected into the Santa Rosa Groundwater Basin, or discharged back to the creek. The City of Thousand Oaks maintains that it owns all of the water rights below the Hill Canyon Plant and the farmers are being supplied with good quality water through the Camrosa Water District. Therefore, there will be no agricultural beneficial use of the surface water between the Hill Canyon Plant and the diversion.

Staff is aware that at least one farmer pumps groundwater from shallow aquifers near Conejo Creek, downstream from the Hill Canyon Plant. The quality of this groundwater likely is impacted by the quality of the surface water in the Creek. The farmer has supplied analytical data that indicate that the chloride levels in his wells have increased over time. The representatives of the City of Thousand Oaks maintain that the farmer has no legal right to the pumped groundwater. However, the Regional Board has no jurisdiction over the legality of water use, and may in fact be required to protect existing beneficial uses regardless of their legality. However, in this case, the farmer has failed to demonstrate that he has grown salt-sensitive crops currently or in the past or, that his land is suitable for the viable cultivation of such crops, or that his existing crops would be impaired by the water quality that meets the current WQO of 150 mg/L.

7.0 Cost Considerations

Several reaches within Calleguas Creek are listed on USEPA's 1998 303 (d) as being impaired for chloride and other salts. The impairment was based on staff's finding that at least 10 percent of ambient water samples assessed exceeded the existing WQO of 150 mg/L. Substantial expenditures likely will be required to address the impairment regardless of the Regional Board's action on this Basin Plan amendment. The most likely remedy will include some level of reverse osmosis (RO) or de-salting treatment and the construction of a pipeline for disposal of the resulting treatment brine (i.e., a "brine line"). The evaluation considered for this Basin Plan amendment is limited to an analysis of the incremental cost that would result from additional treatment required to attain a more stringent WQO of 110 mg/L in the Arroyo Las Posas and Arroyo Simi reaches of the watershed. The level of treatment necessary to meet the existing and purposed WQOs is based on information contained in the "Draft Chloride Total Maximum Daily Load for the Calleguas Creek Watershed and Tributaries—Staff Report" (California Regional Water Quality Control Board—Los Angeles, 2001).

Regional Board staff estimated the cost of RO based on economic evaluations prepared for the adjacent Santa Clara River (CRWQCB-LA, 2000) and information supplied by the County Sanitation Districts of Los Angeles County (Sanitation Districts). The total cost for a proposed brine line was assumed to be $50 million, based on information supplied by the Calleguas Municipal Water District.

Staff's estimated capital RO treatment costs to meet the existing WQOs and proposed WQOs are presented in Tables 8.a. and 8.b. respectively. These tables present the capital cost for the RO treatment equipment, but not the cost for the brine line. Current flows and chloride concentrations

under critical drought conditions were taken from Table 9, of the Draft TMDL (CWRCB-LA, 2001), as were the target chloride concentrations necessary to meet the existing or proposed WQO (see columns 1-4 of Tables 8.a. and 8.b.). It was assumed that only a portion of the influent to the POTWs would be treated with RO and the RO treated effluent would be blended with the remaining effluent to meet the applicable numeric target.

Based on information supplied by the Sanitation Districts, it was assumed that the RO treatment would reduce the chloride concentration by 96%, and that the chloride would be concentrated in the treatment brine, which would amount to 15% of the RO influent flow. The RO treated effluent therefore would be equal to 85% of the RO influent flow. The RO treated effluent would be blended with the remaining POTW effluent to meet the numeric target. Considering these assumptions, the percentage of POTW effluent that must be treated with RO to achieve a "blended concentration" of less than the numeric target was calculated and is presented in column 5 of Tables 8.a. and 8.b. Capital costs were assumed to be $5.4 million per MGD of treatment capacity, based on information supplied by the Sanitation Districts.

The total capital cost of the brine line was assumed to be $50 million. These costs were apportioned to all of the POTWs based on their estimated brine flow and distance in stream miles from the last brine line connection. Stream miles were used because it was assumed that the brine line route would approximate that of the creek flow. It was assumed that the Hill Canyon WWTF could meet its numeric target during routine critical conditions through modification to its existing disinfection process, source control, etc. However, during drought conditions, it is likely that the Hill Canyon Plant would be required to treat a small portion of its influent to reduce chloride loadings to ensure compliance with the a WQO of 150 mg/L in Conejo Creek. Given the relatively small volume of brine that would be produced during these conditions and considering the objections to extending the brine line to the Hill Canyon Plant, it was assumed that the brine would be trucked to the Camarillo WWTP. However, it was expected that the City of Thousand Oaks would contribute to the cost of constructing the brine. For the purposes of allocating a share, Hill Canyon was assigned 1.5 mile of "extended brine line construction." Actual apportionment of the brine line costs among POTWs may differ.

It also was assumed that minor dischargers, including agricultural drains and those who pump groundwater for dewatering or remediation activities would truck their wastewater to the nearest POTW for treatment via RO. Fees collected from the minor dischargers would help offset the cost of the treatment and brine line construction. However, this offset has not been considered herein.

Total capital costs for RO treatment and the brine line to meet the existing WQOs and proposed WQOs are presented in Tables 9.a. and 9.b, respectively. As shown in the referenced tables, the estimated difference in total capital costs for the entire watershed is approximately $20 million. However, because Simi Valley's relative share of the brine line cost would increase due to the increased volume of brine disposed, its costs would increase disproportionately--by approximately $30 million. Apportioning the brine line costs equally among the POTWs based on population or some other measure, would reduce the burden on the Simi Valley ratepayers.

Estimated annualized costs for meeting the existing and proposed WQOs are presented in Tables 10.a and 10.b respectively. The annualized costs were estimated assuming an interest rate of 7% to be financed over 20 years. Annual operation and maintenance costs for the RO treatment were calculated assuming a cost of $1,245 per million gallons of treated influent. It was assumed that the brine line would be constructed to meet the worst case scenario and therefore, drought conditions were used. The actual brine line may be sized larger to accommodate future growth, however; the purpose of this estimate was to calculate the increase in monthly sewage rates for existing users. It was assumed that capital expenditures designed to accommodate future growth will be paid for through hookup fees and special assessments, and will not represent a burden to existing ratepayers.

Table 8.a. RO Capital Cost Estimates to Meet Existing WQOs

POTW/Discharger	Flow (ft3/sec)	Flow (MGD)	Influent Cl Conc. (mg/L)	Target Conc (mg/L)	% Daily Flow Treated	Flow Treated (MGD)	Effluent (-Brine) (MGD)	Effluent Conc (mg/L)	Untreated Flow (MGD)	Blended Conc (mg/L)	Capital Cost ($MM)
Simi Valley GW pumped	3	1.94	180	127	0.40	0.78	0.66	7.19	1.16	117.32	
Simi Valley WQCP	14.1	9.11	134	127	0.20	1.82	1.55	5.38	7.29	111.87	
Simi Total						2.60					14.02
Moorpark	3.1	2.00	140	136	0.10	0.20	0.17	5.61	1.80	128.71	1.08
Hill Canyon	15.2	9.82	141	124	0.25	2.45	2.09	5.63	7.36	110.85	13.26
Pumped GW fr Reach 13	0.5	0.32	186	124	0.45	0.15	0.12	7.44	0.18	112.71	0.78
GW discharge	2	1.29	177	136	0.33	0.43	0.36	7.07	0.87	126.59	2.30
Camarillo WWTP	3.3	2.13	208	136	0.45	0.96	0.82	8.34	1.17	126.37	5.18
Camarillo Total						3.99					7.48
GW discharge near Conjo confluence	1.6	1.03	302	136	0.66	0.68	0.58	12.08	0.35	121.53	3.68
Agriculture	2	1.29	297	136	0.66	0.85	0.72	11.90	0.44	119.66	4.60
Camrosa WWRF	2.3	1.49	299	136	0.66	0.98	0.83	11.96	0.51	120.31	5.30
Camrosa Total											13.58
Watershed Total											49.42

Table 8.b. RO Capital Cost Estimates to Meet Proposed WQOs

POTW/Discharger	Flow (ft3/sec)	Flow (MGD)	Influent Cl Conc. (mg/L)	Target Conc (mg/L)	% Daily Flow Treated	Flow Treated (MGD)	Effluent (-Brine) (MGD)	Effluent Conc (mg/L)	Untreated Flow (MGD)	Blended Conc (mg/L)	Capital Cost ($MM)
Simi Valley GW pumped	3	1.94	180	74	0.66	1.28	1.09	7.19	0.66	72.30	
Simi Valley WQCP	14.1	9.11	134	74	0.55	5.01	4.26	5.38	4.10	68.71	
Simi Total						6.29					33.96
Moorpark	3.1	2.00	138	100	0.33	0.66	0.56	5.52	1.34	98.86	3.57
Hill Canyon	15.2	9.82	141	124	0.25	2.45	2.09	5.63	7.36	110.85	13.26
Pumped GW fr Reach 13	0.5	0.32	186	124	0.45	0.15	0.12	7.44	0.18	112.71	0.78
GW discharge	2	1.29	177	136	0.33	0.43	0.36	7.07	0.87	126.59	2.30
Camarillo WWTP	3.3	2.13	208	136	0.45	0.96	0.82	8.34	1.17	126.37	5.18
Camarillo Total						3.99					7.48
GW discharge near Conjo confluence	1.6	1.03	302	136	0.66	0.68	0.58	12.08	0.35	121.53	3.68
Agriculture	2	1.29	297	136	0.66	0.85	0.72	11.90	0.44	119.66	4.60
Camrosa WWRF	2.3	1.49	299	136	0.66	0.98	0.83	11.96	0.51	120.31	5.30
Camrosa Total						2.52					13.58
Watershed Total											71.85

Table 9.a. Total Capital Costs (RO Treatment and Brine Line) to meet Existing Chloride WQOs

POTW/Discharger	RO Capital ($MM)	Brine Flow (MGD)	Stream Miles from last	Brine Line %	Brine Line Cost ($MM)	Total Capital Cost ($MM)
Simi Valley WQCP		0.12				
Simi Valley GW pumped		0.27				
Simi Total	14.02	0.39	5.3	0.38	18.88	32.90
Moorpark	1.08	0.03	13	0.07	3.57	4.65
Hill Canyon	13.26	0.37	1.5	0.10	5.05	18.31
Pumped GW fr. Reach 13	0.78	0.02				
GW discharge	2.30	0.06				
Camarillo WWTP	5.18	0.14				
Camarillo Total	7.48	0.23	3	0.13	6.30	13.78
GW discharge near Conejo confluence	3.68	0.10				3.68
Agriculture	4.60	0.13				4.60
Camrosa WWRF	5.30	0.15				5.30
Camrosa Total	13.58	0.38	5.2	0.36	17.94	31.53
Watershed Totals		1.39	28**	1.03	51.75***	101.17

* Assumptions: 1) Treatment reduces chloride concentration by 96% 2) 15% of treated water becomes brine 3) Assumes Hill Canyon contributes to extension of line to Camarillo

** Additional brine line miles and ocean outfall costs to be shared equally among POTWs.

*** Sum total of brine line percentages exceeds 1.00 and sum total of brine line costs exceeds $50 million due to rounding.

Table 9.b. Total Capital Costs (RO Treatment and Brine Line) to meet Proposed Chloride WQOs

POTW/Discharger	RO Capital (MM)	Brine Flow (MGD)	Stream Miles from last	Brine Line %	Brine Line Cost ($MM)	Total Cap Cap ($MM)
Simi Valley WQCP		0.19				
Simi Valley GW pumped		0.75				
Simi Total	33.96	0.94	5.3	0.53	26.62	60.58
Moorpark	3.57	0.10	13	0.14	6.86	10.43
Hill Canyon	13.26	0.37	1.5	0.06	2.94	16.20
Pumped GW fr. Reach 13	0.78	0.02				
GW discharge fr. Reach 9A	2.30	0.06				
Camarillo WWTP	5018	0.14				
Camarillo Total	7.48	0.23	3	0.07	3.67	11.15
GW discharge near Conjo	3.68	0.10				
Agriculture	4.60	0.13				
Camrosa WWRF	5.30	0.15				
Camrosa Total	13.58	0.38	5.2	0.21	10.45	24.03
Watershed Totals		2.02	28	1.01	50.54	122.40

* Assumptions: 1) Treatment reduces chloride concentration by 96% 2) 15% of treated water becomes brine 3) Assumes Hill Canyon contributes to extension of line to Camarillo

** Additional brine line miles and ocean outfall costs to be shared equally among POTWs.

*** Sum total of brine line percentages exceeds 1.00 and sum total of brine line costs exceeds $50 million due to rounding.

Table 10.a. Annual Calculated Costs to Meet Existing Chloride WQO

Organization	Interest Rate	Time Financed (Years)	Annualization Factor	Tot. Treat. Cap. Cost ($MM)	Total Share Brine Line ($MM)	Total Capital Cost ($MM)	Annual Capital Cost($MM)	Annual Operating Cost($MM)	Total Annual Cost($MM)
Simi Valley	0.07	20	0.094392926	14.02	18.88	32.99	3.11	1.18	4.29
Moorpark	0.07	20	0.094392926	1.08	3.57	4.65	0.44	0.09	0.53
Thousand Oaks	0.07	20	0.094392926	13.26	5.05	18.31	1.73	1.11	2.84
Camarillo	0.07	20	0.094392926	7.48	6.30	13.78	1.30	0.63	1.93
Camrosa	0.07	20	0.094392926	13.58	17.94	31.52	2.98	1.14	4.12

Table 10.b. Annual Calculated Costs to Meet Proposed Chloride WQOs

Organization	Interest Rate	Time Financed (Years)	Annualization Factor	Tot. Treat. Cap. Cost ($MM)	Total Share Brine Line ($MM)	Total Capital Cost ($MM)	Annual Capital Cost($MM)	Annual Operating Cost($MM)	Total Annual Cost($MM)
Simi Valley	0.07	20	0.094392926	33.96	26.62	60.58	5.72	2.86	8.58
Moorpark	0.07	20	0.094392926	3.57	6.86	10.43	0.98	3.00	3.98
Thousand Oaks	0.07	20	0.094392926	13.26	2.94	16.20	1.53	1.11	2.64
Camarillo	0.07	20	0.094392926	7.48	3.67	11.15	1.05	0.63	1.68
Camrosa	0.07	20	0.094392926	13.58	10.45	24.03	2.27	1.14	3.41

The affordability of RO treatment that likely would be required as a result of this Basin Plan amendment was assessed based on the estimated increase in sewer or user fees (see Table 11) and the resultant fees compared to fees paid by other California communities (see Table 12).

Table 11. Monthly Sewer Rate Increase to Existing Ratepayers to Meet the Proposed WQO

POTW	Existing Rate ($/month)[1]	Added Annual Cost ($MM)	No. of "Residential Sewage Units"	Adjusted Rate ($/month)
Simi Valley	16.10	8.58	33,786[2]	37.26
Moorpark	12.50	3.98	10,500 [3]	43.45
Hill Canyon	20.65	2.64	49,000[4]	25.14
Camarillo	21.08	1.68	12,172[5]	32.58
Camrosa including Agricultural Drains	16.00	3.38	8,257[5]	50.11[6]
Camrosa without Agricultural Drains	16.00	2.55	8,257	41.73

1. SWRCB. May 2001. Wastewater User Charge Survey Report F.Y. 2000-01.
2. Personal Communication. Larry Whitney, Simi Valley WQCP.
3. Personal Communication. Reddy Pakala, Ventura County WWTP.
4. Personal Communication. Dean Moralez, Hill Canyon WWTF.
5. Personal Communication. Douglas Frost. Camarillo Sanitation District.
6. Assumes that Camrosa ratepayers would absorb cost for treatment agricultural drain water. In actuality, farmers likely will be assessed a fee to cover these costs. Ratepayer's fees would be reduced to approximately $42 per month, without the cost of treating the agricultural drain water.

Table 12 provides a sampling of monthly sewage rates from Ventura County and the State of California. A comparison of these rates with the rates projected in Table 12 find that the projected monthly rates are greater than the 2000 average in Ventura County ($23.15), but below the highest rate in the county ($73.75). The rates are less than the average rates paid in San Francisco County. Since the projected costs, which are based on worst-case assumptions, and are within the range of fees paid within Ventura County and the State of California, they are deemed affordable.

Table 12. Range in Sewage Rates for California Statewide and Selected Metropolitan Areas*

Location	**Monthly user charge**
California – Low	$ 5.00
Ventura County, average	$ 23.15
California, average	$ 19.82
San Francisco County, average	$ 45.37
Ventura County Service Area 29 (Ventura County – High)	$ 73.75
California – High	$ 145.50

* SWRCB. May 2001. Wastewater User Charge Survey Report F.Y. 2000-01.

In summary, the total increased capital costs of implementing the proposed Basin Plan amendment was estimated to be approximately $20 million. However, depending on the method used to apportion the brine line

costs, the increased capital costs to be incurred by the Simi Valley WQCP may be as high as $33 million. The resulting monthly residential sewage unit rates were calculated and were below rates paid by other communities within Ventura County, and were below the average rates paid in San Francisco County. Rates were calculated based on worst-case assumptions. Actual rate increases may be less.

Restoring the water quality in the Arroyo Las Posas and the Arroyo Simi to 110 mg/L is expected to fully support the agricultural beneficial use in these sub-watersheds. Staff estimated the annual avocado crop value in this watershed to range between $7 million and $54 million. The total Ventura County Crop Production value has exceeded $1 billion during the past two years, placing the County among the top ten farming regions within the State of California. (Los Angeles Times, June 27, 2001).

8.0 Impacts on Housing

The proposed change in water quality objective for chloride and the likely implementation strategy will allow for continued construction of housing within the cities' boundaries, while providing adequate protection of the water supplies for surrounding farmland.

9.0 Encourages Use of Recycled Water

The proposed change in water quality objectives and the likely implementation strategy will provide higher quality recycled water and likely will encourage greater re-use.

10.0 Staff Recommendation and Alternatives

The staff is recommending to the Regional Board that it consider changing two elements of the 1994 Basin Plan, with respect to the Calleguas Creek.

The following changes to the Water Quality Control Plan are proposed:

1. Change Figure 2-4, Major surface waters of the Calleguas-Conejo Creek Watershed. The Regional Board proposes to revise the figure, changing it from only two reaches (1978 finding) to 14 reaches.

2. Change Table 3-8, Water Quality Objectives for Selected Constituents in Inland Surface Waters. The Regional Board believes that the existing stream reaches need to be updated to reflect 14 reaches, each with differing hydrology, assimilative capacity, chloride loads, and beneficial uses. The proposed Water Quality Objective for reaches 6, 7, and 8 is changed to 110 mg/L based on a 12-month rolling average and an instantaneous maximum value of 180 mg/L. The Water Quality Objective for reaches 3, 4, 5, 9A, 9B, 10, 11, 12 and 13 will remain at 150 mg/L.

10.A Reach Definition

Regarding the reach designations, the staff has considered and presents for the Regional Board the following alternatives:

- Adopt staff's recommendation to divide the watershed into 14 reaches as shown in Figure 2 and described in Table 3.

- No Action. This alternative would retain the existing two reach definition, north and south from Potrero Road

- Adopt another reach designation.[1]

The pros and cons of each of the above-described alternatives are summarized in Table 13.

10.B Revision of the Chloride WQO

The staff has considered and presents to the Regional Board the following alternatives related to the chloride water quality objective:

- Adopt staff's recommendation to revise the chloride WQO in the northern reaches (Reaches 6, 7, and 8) from 150 mg/L to 110 mg/L based on a 12-month rolling average, with a maximum not to exceed value of 180 mg/L

- No action (i.e., retain the existing WQO of 150 mg/L for all waterbodies north from Potrero Road)

- Revise the chloride objective of 150 mg/L to 110 mg/L based on a 12-month rolling average and an instantaneous maximum of 180 mg/L for all reaches north from Potrero Road (Proposed Reaches 2, 3, 4, 5, 6, 7, 8, 9a, 9b, 10, 11, 12, and 13.)

The pros and cons of each of the above-described alternatives are summarized in Table 13.

[1] Staff has not proposed specific, alternate reach definitions because it was not aware of any other logical manner to segment the water bodies considering hydrogeology and beneficial uses. Nonetheless interested persons may propose alternate reach definitions during the public comment period.

Table 13. Summary of Staff's Recommendations and Alternatives

Reach Designation	Alternative	Pros	Cons
Revise Reaches	Staff Recommendation: Change to 14 Reaches as described in 3 and Figure 2 herein.	Recognizes differences in beneficial uses and hydrogeology throughout the watershed. Facilitates the development of TMDLs and Water Quality Assessments.	None identified.
	No Action. Retain the existing reach designations.	None identified.	Fails to recognize differences in beneficial uses and hydrogeology throughout the watershed
	Adopt a different reach designation.	The value of an alternative reach designation cannot be evaluated without specific details.	Would require further staff analysis and would delay TMDL development within the watershed.
Revise Chloride WQO	Staff Recommendation to revise the chloride WQO in the northern tributaries from 150 mg/L to 110 mg/L based on a 12-month rolling average and an instantaneous maximum value of 180 mg/L	Will fully support agricultural beneficial uses in the northern tributaries; representative of pre-drought water quality.	Will raise sewage rates in Simi Valley and possibly other communities that share the proposed brine line. However, the rates would be less than rates paid in other communities within California.
	Revise WQO for all reaches north from Potrero Road from 150 mg/L to 110 mg/L based on a 12-month rolling average and an instantaneous maximum value of 180 mg/L.	Would provide equal protection of agricultural beneficial uses throughout Calleguas Creek Watershed. However, little evidence was presented to demonstrate that improved water quality in these reaches would result in increased viability of agriculture or that agriculture in these subwatersheds would be impaired at the current WQO of 150 mg/L.	Would likely require the extension of the brine line to the Hill Canyon WWTF, at an additional cost of $4.5 million, with possible adverse impacts to riparian habitat. All surface water available for diversion below Hill Canyon will be diverted downstream at the Camrosa Diversion, which is presently under construction. To date, approximately $15 million has been expended on the construction of the Camrosa Diversion been constructed.

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Appendix A
Correspondence from Zone Mutual Water Company

Appendix B
Letter from Richard H. Hajas, General Manager, Camrosa Water District Regarding Water Rights and Crops Grown in Conejo Creek Tributaries

Appendix C
Survey of Crops Grown in Conejo Creek Tributaries and Calleguas Creek Submitted by the Calleguas Municipal Water District

Appendix D
Correspondence from Mr. Howard Jones

Appendix E
Letter from Don Kendall, General Manager Calleguas Municipal Water District Regarding Brine Line Construction